THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA

SEPTEMBER 2022 EXAMINATIONS (PART II)

FINANCIAL ACCOUNTING

PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER

EXAMINATION INSTRUCTIONS

1. All solutions should be in ink. Any solution in pencil will not be marked.

2. Read all instructions on each part of the paper carefully before answering the questions.

3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**

4. Check your pockets, purse, mathematical set, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.

5. Do not enter the hall with anything written on your docket.

6. Insert your examination number in the space provided above.

TUESDAY, 27 SEPTEMBER 2022

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA
ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
PART II EXAMINATIONS – SEPTEMBER 2022

FINANCIAL ACCOUNTING

Time Allowed: 3 hours

SECTION A: PART I   MULTIPLE-CHOICE QUESTIONS   (30 Marks)

ATTEMPT ALL QUESTIONS IN THIS SECTION

Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements

1. To record cash received on application on issuing of shares. The accounting entries required are:

    A.   DR Share capital   CR Application account
    B.   DR Cash account   CR Share Capital account
    C.   DR Cash account   CR Application account
    D.   DR Cash account   CR Cash share premium account
    E.   DR Cash account   CR Allotment account

2. In the final accounts of not-for-profit organisation, capital expenditures are recorded in

    A.   Income and expenditure account
    B.   Subscription account
    C.   Capital expenditure account
    D.   Statement of financial position
    E.   Statement of profit or loss account

3. Ade, Obi, and Musa are in partnership. Their respective capital accounts had the following balances: ₦600,000, ₦750,000 and ₦1,050,000. The partners agreed to admit Dapoas a new partner with a one-fifth interest in the partnership capital in exchange for ₦750,000 cash. Dapo's equity in the resulting partnership is

    A.   ₦480,000
    B.   ₦600,000
    C.   ₦630,000
    D.   ₦720,000
    E.   ₦750,000

4. Which of the following is **NOT** an attribute of a partnership?

   A. The liabilities of members are unlimited
   B. Every member is entitled to share in the profit on the agreed profit ratio
   C. The business has no perpetual succession
   D. There is obligation under the law to prepare financial statements
   E. Taxes are paid by individual partners and not the firm as an entity

5. Which of the following accounting records are source documents?

   A. Journals and ledgers
   B. Sales invoice and cash book
   C. Cash book and debit note
   D. Payment vouchers and ledgers
   E. Sales invoice and debit note

6. A trial balance is prepared from net account balances in the ledger in order to

   A. Classify the ledgers
   B. Correct error of original entry
   C. Test the arithmetical accuracies of the ledger account balances
   D. Identify statement of financial position items
   E. Provide basis for establishing accountant's competence

7. Which of the following is **NOT** a component of financial statements under IAS 1

   A. Statement of financial position
   B. Statement of Profit or Loss and other comprehensive income
   C. Statement of changes in equity
   D. Statement of affairs
   E. Statement of cash flows

8. Which of the following should **NOT** be included in the cost of inventory

   A. Normal amount of wasted material
   B. Administrative overhead
   C. Purchase price
   D. Import duty
   E. Variable production overhead

9. The following represents extracts from the trading account of a retail outlet for a given month:

	GH¢
Opening inventory	480,000
Closing inventory	1,280,000
Other expenses	400,000
Sales	2,200,000
Profit	180,000

What is the purchase figure for the month?

A. GH¢2,600,000
B. GH¢2,020,100
C. GH¢2,400,000
D. GH¢2,240,000
E. GH¢2,420,000

10. The trial balance showed wages of ₦25,000 debit balance and additional information revealed that ₦5000 wages were due but unpaid. Determine the amount of wages to be disclosed in the statement of profit or loss and in the statement of financial position.

A. Profit or loss in the statement of income ₦30,000, wages ₦5,000 in the statement of financial position
B. Profit or loss ₦20,000, wages ₦5,000 in the statement of financial position
C. Profit or loss ₦5,000, wages prepaid₦30,000 in the statement of financial position
D. Profit or loss ₦25,000, wages ₦5,000 in the statement of financial position
E. Profit or loss ₦5,000, wages ₦20,000 in the statement of financial position

11. A member of a club paid L$10,000 as his subscription for 2021 and L$12,000 as a subscription for 2022. If the financial year of the society ended on December 31, 2021, the L$12,000 subscription will be treated in the statement of financial position as

A. Current asset
B. Current liability
C. Capital
D. Asset
E. Profit

12. The necessary accounting entries to record interest on a partner's drawings are

   A. Dr. Profit or loss appropriation account and Cr. Partner's current account
   B. Dr. Profit or loss account and Cr. Partner's account
   C. Dr. Partner's current account and Cr. Profit and loss account
   D. Dr. Interest account and Cr. bank account
   E. Dr. Partner's current account and Cr. profit or appropriation account

13. Which of the following is **NOT** to be included in ascertaining the cost of Non-Current asset

   A. Delivery and handling cost
   B. Cost of site preparation
   C. Cost of the PPE per supplier's invoice
   D. Estimated discounted cost to be incurred for the installation
   E. Interest charges paid to the supplier for deferred credit

14. The accounting ratio that measures the ability of an entity to pay its debt quickly is

   A. Current ratio
   B. Cash ratio
   C. Acid test ratio
   D. Return on investment ratio
   E. Gearing ratio

15. In preparing accounting records, the owners of a business and the business are treated as

   A. The same person
   B. Having a business relationship
   C. Separate legal entities
   D. Partners
   E. Mutually dependent

16. The document that is used to acknowledge the acceptance of goods returned by a seller from the buyer is

   A. Credit note
   B. Debit note
   C. Goods received note
   D. Invoice
   E. Voucher

17. The effect of the payment of a liability is that it

    A. Increases both assets and liabilities
    B. Increases assets and decreases liabilities
    C. Decreases assets and increases liabilities
    D. Decreases bank and increases payables
    E. Decreases both assets and liabilities

18. If an accounts clerk posted ₦890 into a ledger instead of ₦980, this error is referred to as

    A. Error of misplacement
    B. Error of transposition
    C. Error of principle
    D. Error of commission
    E. Error of omission

19. A cheque issued for payment to a supplier already shown in the cash book, but not reflected on the debit side of the bank statement is

    A. Uncredited cheque
    B. Dishonoured cheque
    C. Direct remittance to the bank
    D. Direct debit by bank
    E. Unpresented cheque

20. XYX Limited with an accounting year-end of September 30, 2020 paid a rental of ₦820,000 which covers 3 years up to September 30, 2022 including ₦100,000 which was outstanding in respect of rent for 2019 which was accrued for. Determine the rent that would be charged in the company's statement of profit or loss for the year ended September 30, 2020

    A. ₦240.000
    B. ₦340,000
    C. ₦620,000
    D. ₦720,000
    E. ₦820,000

21. Which of the following will **NOT** be reported in the statement of profit or loss?

    A. Interest on loan
    B. Dividend paid
    C. Distribution costs
    D. Administrative cost
    E. Income tax expense

22. In presenting statement of cash flow, which of the following is cash and cash equivalent?

    A. Investment in equity shares
    B. Loan
    C. Bank overdraft
    D. Deposit for shares
    E. Irredeemable preference shares

23. Which of the following will **NOT** be reported in the statement of cash flow

    A. Issuance of shares to acquire property
    B. Purchase of plant and machinery
    C. Proceed from sales of non current asset
    D. Payment of dividend
    E. Proceed from issue of debentures

24. The agreement of a trial balance will **NOT** disclose which of the following fundamental errors in the accounting books

    A. Errors in computing the balances
    B. Transposition of figures
    C. Errors of wrong posting in the debit and credit column
    D. Errors of principle
    E. Double entry errors

25. The accounting concepts which support the assertion that economic reality takes precedence over legal issues is

    A. Realisation concept
    B. Substance over form
    C. Conservatism
    D. Matching Concept
    E. Measurement concept

26. A sole proprietor paid his personal income tax by withdrawing cash for the payment from his business. The double entry posting in the ledger with respect to the above transaction is

    A.   DR Taxation account;   CR Cash account
    B.   DR Personal Tax account;   CR Bank account
    C.   DR Drawings account;   CR Cash account
    D.   DR Cash account;   CR Drawing account
    E.   CR Cash account;   DR Taxation account

27. A company with ordinary shares of 80kobo each issued shares at a price of 50k per share. This means that the share was issued at

    A.   A premium of 20k per share
    B.   The market price of 130k
    C.   A discount of 30k per share
    D.   Par
    E.   A bonus

28. The accrued salary of GMD365,000 due to employees for December31 2021 was omitted in the financial statements prepared for the year ended December 31, 2021. Which of the following statement will be correct with respect to the above statement?

    A.   Asset of the company would be overstated by GMD365,000
    B.   Liability of the company would be overstated by GMD365,000
    C.   Gross profit of the company would be overstated by GMD365,000
    D.   Liabilities of the company would be under-stated by GMD365,000
    E.   Capital of the company would be over-stated by GMD365,000

29. Which of the following is **NOT** required to be disclosed under IAS 2, Inventory?

    A.   Accounting policies adopted for measurement of inventory
    B.   Physical count of inventory at the end of the period
    C.   Amount of inventories recognised as expense during the period
    D.   Carrying amount of inventories pledged as security for liabilities
    E.   Carrying amount of inventories carried at fair value less cost of sell

30. Which of the following should be credited to partners' capital account?

    A.   Goodwill written off
    B.   Share of profits
    C.   Interest on drawings
    D.   Share of revaluation profits
    E.   Interest on loan advanced by a partner

SECTION A: PART II   SHORT-ANSWER QUESTIONS   (20 MARKS)

ATTEMPT ALL QUESTIONS

Write the correct answer that best completes each of the following questions/statements.

1. Assets held for resale in the ordinary course of business is called ……………………………

2. Credit balance carried down in the subscriptions account of a not-for-profit organisation at the end of an accounting year is …………………………......

3. The accounting entries for assets taken over by a partner at partnership dissolution is ………………………… and …………………………

4. The type of shares that carried voting rights in a company is called ……………

5. **TWO** errors that would not affect the agreement of a trial balance are ………………… and …………………

6. The aggregate of ordinary share capital and reserves of a company is also referred to as ………………………..

7. The two methods of preparing cash flow statements as stipulated by IAS 7 are …………………… and …………………………..

8. When a trial balance fails to agree due to the effect of some yet to be identified errors, the difference is recorded in ………………… account

9. A listing of balances of all the accounts in a double entry system divided into debit and credit columns is called …………………………..

10. Excess of current assets over current liabilities is called …………………………

11. Interest received should be classified in Statement of Cash Flows as …………………… activity.

12. The formula for calculating dividend yield is known as …………………..

13. The formula for computing inventory turnover ratio is ………………………

14. The initial trial balance which incorporate details of accounting adjustment made and financial statement summary is referred to as ………………………

15. The account prepared for partners but not required for sole traders is ……………………………

16. Two of the threats identified by the International Federation of Accountants (IFAC) that may affect professional accountants from compliance with ethical behaviour are ………………….. and …………………………..

17. **TWO** Fundamental principles set out in the professional code of ethics are ……………………….. and ………………………

18. In a not-for-profit organisation, the excess of expenditure over income is called………………………

19. The events that occur between the reporting date and the date when the financial statements are authorised for issue is known as …………………………..

20. **TWO** examples of intangible asset are ………………… and …………………

SECTION B: ATTEMPT ANY FOUR QUESTIONS   (50 MARKS)

QUESTION 1

The following information were extracted from the financial statements of Ukwa Limited a manufacturing company for the year ended December 31, 2021.

	₦
Revenue	2,560,000
Cost of sales	(800,000)
Gross profit	1,760,000
Wages and salaries	(580,000)
Other operating exp (including depreciation ₦50,000)	(700,000)
Interest charges	(100,000)
Net profit before taxation	380,000
Tax expense	(80,000)
Profit for the year	300,000

Extract from the statement of financial position are as follows:

	At January 1 ,2021 ₦	At December 31,2021 ₦
Trade receivables	466,000	438,000
Inventory	236,000	248,000
Trade payables	204,000	250,000
Accrued wages and salaries	16,000	10,000
Accrued interest charges	60,000	90,000
Tax payable	104,000	86,000

Required:

Prepare statement of cash flows (**Operating activities only**) for the year ended December 31, 2021 using:

a. Indirect method (6½ Marks)

b. Direct method (6 Marks)
(Total 12½ Marks)

QUESTION 2

a. A business tries to make profit by selling goods and services to customers. This creates revenue or income for the business.

Explain the purpose of the following documents used in a system designed to account for sales

i. Delivery note
ii. Credit note
iii. Sales invoice
iv. Goods despatched note (6 Marks)

b. Business can analyse the amount of cash received and paid in any way it chooses.

Required:

Explain petty cash and imprest system. (3½ Marks)

c. Explain **TWO** threats that may affect professional accountants from complying with ethical behaviour. (3 Marks)
(Total 12 ½ Marks)

QUESTION 3

Okeke and Dawodu are in partnership sharing profits in the ratio 3:2. Their draft statement of financial position as at February 28, 2021 is as follows:

	L$'000
Assets	
Non-current assets:	
Freehold property	30,000
Furniture and fittings	1,000
Motor vehicles	3,000
	34,000

Current assets:

Receivables	20,000
Bank balance	600
	20,600
Total assets	54,600

Equity and liabilities
Capital accounts:

Okeke	20,000
Dawodu	2,500
	22,500

Current accounts

Okeke	3,000
Dawodu	500
	3,500

Non-current liabilities:

Loan from Okeke	16,000

Non-current liabilities:

Payables	12,600
Total equity and liabilities	54,600

Additional information:

(i) Okewo Limited was incorporated for the purpose of taking over the business.

(ii) It was agreed to take over the freehold property at valuation of L$40,000,000. The other assets, except cash and motor vehicles, were taken over at book values. The current liabilities were also taken over by the new company.

(iii) The purchase consideration of L$90,000,000 is to be settled by 25,000,000 L$1 ordinary shares and L$40,000,000 cash obtained by bank overdraft. The partners agreed to divide the shares in their profit-sharing ratio.

(iv) Dawodu is to take over the cars at a valuation of L$2,500,000 while Okeke's loan is to be paid by the partnership.

Required:

a. Prepare the following accounts to close the books of the partnership.

    i.   Realisation account   **(3 Marks)**

    ii.   Partners' capital accounts in columnar form   **(3 Marks)**

    iii.   Okewo Limited account   **(2 Marks)**

    iv.   Bank account   **(2½ Marks)**

b.   Prepare the purchase of business account of Okewo Limited as March 1, 2021
(2 Marks)
(Total 12½ Marks)

QUESTION 4

The International Accounting Standard Board (IASB) conceptual framework dealt with the qualitative characteristics of useful financial information.

a.   State and define the two classes of qualitative characteristics identified by IASB
(6 Marks)

b.   Expenses is an item of financial information to be disclosed in the Income statement of a business economic entity

   i.   Define Expenses   **(½ Mark)**

   ii.   State and explain the **THREE** general principles of expenses recognition
(6 Marks)
(Total 12½ Marks)

QUESTION 5

a.   With the adoption of IFRS as the financial reporting standards, entities financial statements are now required to comply with the provisions and requirements of applicable IFRSs.

   List the component of a complete set of IFRS financial statements.   **(3½ Marks)**

b.   The regulatory framework is the most important element in ensuring that financial information is relevant and presented faithfully to meet the needs of shareholders, lenders, creditors, tax authorities, government, and other users. Regulation would enhance comparability and transparency of financial statements.

   List the sources of these regulations.   **(3 Marks)**

c.   Accounting standards are common sets of principles and procedures that define the basis of financial accounting policies and practices. They apply to the whole spectrum of an entity's financial transaction and other events, including assets, liabilities, revenue, expenses, and equity.

   State **FOUR** advantages of Accounting Standards   **(6 Marks)**
(Total 12½ Marks)

QUESTION 6

a.   Define ethics   (1 Mark)

b.   What are the **FIVE** professional codes of ethics in accounting?   (2½ Marks)

c.   State **FOUR** reasons why ethics is important in accounting   (4 Marks)

d.   State the consequences of unethical financial reporting on the going concern of a business entity and its effect on stakeholders.   (5 Marks)
                                                                                 (Total 12½ Marks)

SECTION A - PART 1

MULTIPLE-CHOICE SOLUTIONS

1.   C

2.   D

3.   C

4.   D

5.   E

6.   C

7.   D

8.   B

9.   E

10. A

11. B

12. E

13. E

14. C

15. C

16. A

17. E

18. B

19. E

20. A

21. B

22. C

23. A

24. D

25. B

26. C

27. C

28. D

29. B

30. D

Examiner's comment

All candidates attempted these questions being compulsory and performance was good.

SECTION A - PART II

SHORT-ANSWER SOLUTIONS

1. Inventory

2. Subscriptions in arrears

3. Dr Partner's Capital Account

   Cr Realization Account

4. Ordinary shares

5. Error of omission

   - Error of commission

   - Error of principles

   - Compensating error

   - Error of original entry

   - Complete reversal of entry

6. Shareholder's Fund

7. Direct and Indirect

8. Suspense Account

9. Trial Balance

10. Working capital or Net Current Assets

11. Operating Activities or Investing Activities

12. Dividend Yield = $\dfrac{\text{Dividend Per Share}}{\text{Market Price per Share}} \times 100$

13. Inventory Turnover Ratio = $\dfrac{\text{Cost of sales}}{(\text{Opening stock} + \text{Closing stock}) \div 2}$

Or

$\dfrac{\text{Cost of sales}}{\text{Average Inventory}}$

14. Extended Trial Balance/worksheet

15. Partner's Current Account/Appropriation Account

16. Self-interest threats or Conflict Interest:

    Self-review threats

    Advocacy threats

    Familiarity threats

    Intimidation threats

17. i. Integrity

    ii. Objectivity

    iii. Professional competence and due care

    iv. Professional behaviour

    v. Confidentiality

    vi. Independence

18. Deficit

19. Post balance sheet events

20. Franchise,

    Patents,

    Goodwill,

Copyright

Computer softwares

Examiner's comment

All candidates attempted these questions and performance was also good.

SECTION B

SOLUTION 1

i. Ukwa Limited Statement of cashflows (operating activities) for the year ended December 31,2021 – using indirect method

Operating activities	₦
Profit before taxation	380,000
Adjustment:	
Depreciation	50,000
Interest charges	100,000
	530,000
Movement in working capital:	
Decrease in receivable (₦466000 - ₦438000)	28,000
Increase in inventory (₦248000 - ₦236000)	(12,000)
Increase in trade payables (₦250000+ ₦10000)- (₦204000+ ₦16000)	40,000
Cash generated from operations	586,000
Taxation paid (w1)	(98,000)
Interest charges paid (w1)	(70,000)
Net cashflows from operating activities	**418,000**

ii. Ukwa Limited Operating cashflows using direct method for the year ended December 31 , 2021

Cash flows from operating .activities	₦
Cash receipts from customers(W2)	2,588,000
Cash payments to suppliers (w3ii)	(766,000)
Cash payments to employees(w4)	(586,000)
Cash paid for other operating expenses	(650,000)
	586,000
Taxation paid (w1)	(98,000)
Interest paid(w1)	(70,000)
Net cash flow from operating activities	418,000

Workings:

W1 Interest and tax paid

	Tax	Interest
	₦	₦
Liability at the beginning of the year	104,000	60,000
Charged for the year.	80,000	100,000
	184,000	160,000
Liability at end of the year	(86,000)	(90,000)
Payment for the year	98,000	70,000

W2 Cash received from customers

	₦
Trade receivables at Jan.1 2021	466,000
Sales for the year	2,560,000
	3,026,000
Trade receivables at December 31 2021	(438,000)
Cash sales	2,588,000

W3i. Purchases

	₦
Closing inventory at December 31, 2021	248,000
Cost of sales	800,000
	1,048,000
Opening inventory Jan.1 2021	(236,000)
Purchases (w4)	812,000

W3ii. Cash paid for materials supplied

	₦
Trade payables at Jan. 1, 2021	204,000
Purchases (w3i)	812,000
	1,016,000
Trade payables at December 31, 2021	(250,000)
Cash paid for materials	766,000

W4 Cash paid for wages and salaries

	₦
Accrued wages and salaries Jan. 1 2021	16,000
Wages and salaries for the year	580,000
Accrued wages and salaries at December 31, 2021	(10,000)
Cash paid for wages and salaries	586,000

Examiner's comment

The question tested candidates understanding of direct and indirect presentation of cash flow. About 55% of the candidates attempted the question but their performance was below 40%.

SOLUTION 2

a. **Delivery note:**

This is a document that accompanies the goods to the customer. The customer will check this to make sure that it agrees with his sales order and that it is consistent with what has actually been delivered.

Credit note:

This is a document issued when a customer returns goods or the customer had been over charged and the business agrees to this. The business issues a credit note to acknowledge that the amount specified is no longer owed to them by the customer.

Sales invoice:

A sales invoice serves as the source document to record in the sales day book. It is a document sent by the seller to the buyer requesting the buyer to pay for the amount stated on the invoice for goods or services rendered to the customer. Invoice normally shows date, details of transactions and payment terms.

Goods dispatched note:

This is a notice to customer to inform that the goods ordered have been dispatched. The note specifies the number of items ordered, weight, name of sender and addressee.

b. **Petty cash**

Petty cash is cash inform of notes and coins held by a business to pay for small items of expenses where it is more convenient to pay in notes and coins than to pay through the bank account.

Petty cash might be used, for example to pay for transport fare, office stationery and other office expenses.

Usually the amounts involved in petty cash in most businesses are very small. It is one of the easiest assets that can be stolen

Usually the responsibility for looking after petty cash is assigned to an accounts clerk. The accounts clerk will also maintain a petty cash book. This cash book is a book of prime entry and it is summarised and posted into the general ledger on a periodic basis.

Imprest system

Imprest system is a system of operating the petty cashbook whereby an amount called Float is given to the petty cashier at the beginning of a period, out of which minor or petty expenses are to be disbursed and at the end of the period, the petty cashier shall be reimbursed based on the total amount disbursed out of the original float.

c. **Threats that may affect professional accountants from complying with ethical behaviour**

   i) **Self-interest threats or conflicts of interest:** These occur when the financial and other interests of the professional accountant, or a close family member, inappropriately affect the accountant's decisions or actions.

   ii) **Self-review threats:** This is the threat that a professional may not review appropriately some work done previously by him or by another individual within the same firm. A typical example is a situation where a professional accountant prepares the annual financial statements for a client and then is appointed to do the audit.

   iii) **Advocacy threats:** This type of threat can occur when an accountant promotes the point of view of a client, for example by acting as a professional witness in a legal dispute. This may impair the objectivity of the accountant.

   iv) **Familiarity threats:** This is the threat that results from a long or close relationship with the client such that an accountant might become too sympathetic to the client and more willing to accept the client's point of view.

   v) **Intimidation threats:** A professional accountant might find that his objectivity and independence is threatened either real or perceived pressures.

Examiners' comment

The question tested knowledge of different types of some document used in business transactions and also knowledge of petty cash operation based on imprest system. The question also tests knowledge of professional accountant ethical behaviour.

About 85% of candidates attempted the question and performance was above 80%. Candidates understood the question, however Part C of the question was poorly answered by about 40% of the candidates.

SOLUTION 3

a)   Closing the partnership books of Okeke and Dawodu on February 28, 2021

(i)   **Realisation Account**

	N'000		N'000
Freehold property	30,000	Okewo LTD.- Purchase Consideration	90,000
Fixtures and fittings	1,000	Capital account Dawodu- (Motor Vehicle taken over)	2,500
Motor vehicle	3,000	Payables	12,600
Receivables	20,000		
Capital accounts:			
Okeke 3/5 x 51,100	30,660		
Dawodu 2/5 x 51,100	20,440		
	105,100		105,100

(ii)   **Partners' capital accounts**

	Okeke	Dawodu		Okeke	Dawodu
	N'000	N'000		N'000	N'000
Realisation-MV		2,500	Balance b/d	20,000	2,500
Shares in Okewo Ltd	30,000	20,000	Current accounts	3,000	500
Bank	23,660	940	Share of profits	30,660	20,440
	53,660	23,440		53,660	23,440

(iii)   **Okewo Ltd.**

	₦'000		₦'000
Realisation- consideration	90,000	Capital-Okeke	30,000
		Dawodu	20,000
		Cash	40,000
	90,000		90,000

(iv)   **Bank account**

	₦'000		₦'000
Balance b/d	600	Loan- Okeke	16,000
Okewo Ltd	40,000	Capital-Okeke	23,660
		-Dawodu	940
	40,600		40,600

b)   Okewo Limited Books
      Purchase of business account as at 1 March 2021.

	₦'000		₦'000
Payables	12,600	Assets:-	
Share capital	25,000	Freehold property	40,000
Share premium	25,000	Fixtures and fittings	1,000
Bank overdraft	40,000	Receivables	20,000
		Goodwill	41,600
	102,600		102,600

Examiner's comment

The question tests knowledge of conversion of partnership business to Limited Liability Company. It also requires the ledger accounting entries to close the book of partnership.

The question was attempted by about 60% of the candidates. Part a(i) and (ii) were well attempted and score was about 70% of the allocated marks. Part a(iii) and (iv) and 3b were the major pitfall in the question and were poorly answered.

SOLUTION 4

a) The two qualitative characteristics of useful financial information are:

   i) **Fundamental qualitative characteristics** are strong attributes or qualities which make financial information useful. They consist of Relevant and faithful representation

   ii) **Enhancing qualitative characteristics** increase the usefulness of financial information that is relevant and faithfully represented. They consist of:
   - Comparability
   - Verifiability
   - Timeliness; and
   - Understandability

b) i) Expenses are decrease in economic benefits during the accounting period in the form of outflows or depletions of assets or incurrence of liabilities that result in decreases in equity, other than those relating to distribution of equity participation.

   ii) **The three general principles of expenses recognition are**
   a) **Direct matching Principle** – certain costs are recognized as an expense on the basis of direct association with specific revenues. When a product is sold, the purchase cost or production cost of the units sold automatically becomes an expense. Many costs cannot be directly related to specific revenues.

   b) **Immediate recognition principle** – Some costs cannot be directly associated with particular revenue nor is there any basis for systematically associating them with a number of accounting periods such costs, e.g. salaries and wages, rent, electricity, etc are consequently regarded as an expense in the current accounting period.

   c) **Cost Allocation Principle** – Cost of a non-current assets are allocated over the number of accounting years that benefitted from its use. Depreciation is an application of this principle. A pattern of benefits is assumed for the years benefitting from the asset and this assumed pattern determines the expensing of the cost to each accounting year.

Examiner's comment

The question tests knowledge of International Accounting Standard Board (IASB) conceptual framework that dealt with the qualitative characteristics of useful financial information. It also tests knowledge of what constitute business expenses and the general principles of expenses recognition.

About 70% of candidates attempted the question and performance was above 50% of the marks allocated. Candidates understood part **a** and **b(i)** while **b(ii)** was poorly answered. Most of the candidates could not explain the three general principles of expenses recognition.

SOLUTION 5

a) Component of a complete set of financial statements are:
   i. Statement of profit or loss and other comprehensive income
   ii. Statement of changes in equity
   iii. Statement of financial position
   iv. Statement of cash flows
   v. Notes to the financial statements, comprising a summary of significant accounting policies and other explanatory information.

b) Sources of Regulation are:
   i. The company law
   ii. Accounting standards, that is, International Financial Reporting Standards (IFRSs).
   iii. Listing rules in the stock market

c) Advantages of Accounting Standards are:
   i. Improve the reliability of financial statements because the reliability of the statements can be tested against the prescriptions of the relevant standards
   ii. Allow for inter-firm and intra-firm comparisons, which allows users of financial statements to check the progress of the firm and its position in the market effectively
   iii. Allow interpretations of financial statements by users

iv. Ensure uniformity in the preparation of financial statements of entities within the same industry.

v. Ensure that financial statements of entities are prepared in consistent manner every year

vi. Ensure that financial statements are prepared in a transparent manner, based on rules and principles.

Examiner's comment

The question tests knowledge of what constitutes components of complete set of financial statement according to IFRS. It also tests knowledge of regulatory framework that guides presentation of financial statement and the knowledge of advantages of accounting standards.

About 80% of the candidates attempted the question and performance was also good. While the candidates understood (a) and (b) part of the question, the (c) part was poorly answered as many candidates could not state the advantage of accounting standards.

SOLUTION 6

a) **Accounting ethics refers** to compliance with specific rules and guidance set up by governing bodies that every person associated with accounting should comply with to prevent mis-use of the financial information or their management position.

b) **Accounting code of ethics requires professional accountants to comply with five fundamental principles of**
- Integrity
- Objectivity
- Professional competence and due care
- Confidentiality
- Professional behaviour

c) **Reasons why ethics is important**
- Accountant deals with sensitive financial information.
- The mistakes or acting unethically by accountants could lead to liquidation of the company.

- An accountant is seen as a professional. Part of being ethical in accounting is following certain accounting rules and laws set by the Financial Accounting Standards Boards.
- Less risk for legal battle. Non-compliant with accounting rules may drag an accountant into some legal battles.
- An accountant is expected to act ethically to prevent fraud and other irregularities.

d) The going concern of the business entity may be threatened, leading to liquidation of the entity which consequently lead to:
- Loss of investment
- Loss of revenue to the government
- Loss of jobs by employees
- Loss of source of patronage by suppliers
- Lack of investors' confidence
- Lawsuit from lenders and creditors
- Integrity and reliability of financial statements will be in doubt.

Examiner's comment

The question tests knowledge of what constitutes accounting professional ethics and the consequences of unethical financial reporting on the going concern of a business entity and its effect on shareholders.

About 70% of candidates attempted the question out of which about 60% of them scored above average. Performance of the candidates was good on Part (a) and (b) while part (c) and (d) constituted the major pitfall.

THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
SEPTEMBER 2022 EXAMINATIONS (PART II)

PUBLIC SECTOR ACCOUNTING

PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER

EXAMINATION INSTRUCTIONS

1.   All solutions should be in ink. Any solution in pencil will not be marked.

2.   Read all instructions on each part of the paper carefully before answering the questions.

3.   Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**

4.   Check your pockets, purse, mathematical set, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.

5.   Do not enter the hall with anything written on your docket.

6.   Insert your examination number in the space provided above.

WEDNESDAY, 28 SEPTEMBER, 2022

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

PUBLIC SECTOR ACCOUNTING

Time Allowed: 3 hours

SECTION A: PART I   MULTIPLE-CHOICE QUESTIONS   (30 Marks)
ATTEMPT ALL QUESTIONS

Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements

1.   Which of the following is **NOT** an attributes of Public Sector Accounting?

    A.   Cash basis of accounting
    B.   IPSAS accrual basis of accounting
    C.   Fund accounting
    D.   Provision of private goods and services
    E.   Keeping Departmental Vote Expenditure Allocation Book (DVEA)

2.   Which of the following is **NOT** in the concurrent legislature items in the Nigeria Constitution 1999 (as amended)

    A.   Commerce
    B.   Agriculture
    C.   Health
    D.   Foreign mission
    E.   Transport

3.   Which of the following is **NOT** a duty of the Local Government Council?

    A.   Making laws, debating and passing local government legislation
    B.   Debating, approving and possibly amending local government annual budgets
    C.   Monitoring the implementation of projects and programs in the local government annual budgets
    D.   That there is compliance with the provisions of the Financial Memoranda
    E.   Taking care and custody of the Local Government Finance whether in cash or held in the Local Government Bank Account

4. Which of the following is **NOT** among the conditions for granting immediate retirement benefits?

    A. On compulsory retirement on attaining the retirement age of 60 years
    B. On voluntary withdrawal of service having served for 3 years and 9 months
    C. Retirement on public interest
    D. On Health ground
    E. On voluntary retirement after serving for qualifying period of 35 years

5. Under the contents of the financial reports prepared by the Office of the Accountant-General, education is classified under the

    A. Economic sector
    B. Legal sector
    C. Social service sector
    D. Administration sector
    E. Health and technological sector

6. The cost of stores which are chargeable direct to, and remain a charge to National Chart of Accounts (NCOA), the code of expenditure in which funds for their purchase are provided in the estimate is

    A. Expendable stores
    B. Non-Expendable stores
    C. Allocated stores
    D. Unallocated stores
    E. Consumable stores

7. Which of the following is used in the preparation of bank reconciliation statements

    A. Vouchers and bank statements.
    B. Cash book and advances register
    C. Cash book and bank statements
    D. Store Issues Voucher and Payroll
    E. Cheque summary register and cheque stumbs

8. The treasury cash book is used to record

    A. Receipt of funds only
    B. Payments of money only
    C. Receipt and payment above the line only
    D. Payment of salary advance only
    E. All receipt and payments irrespective of their nature

9. Which of the followings is a **SOURCE** of revenue into the Federation Account?

   A. Petroleum Profit Taxes (PPT)
   B. Rent of government Properties
   C. Arms selling license fees
   D. Reimbursements
   E. Court fees

10. The officer that liaise with the Chairman of local government and the house of legislation when there is bound to be a meeting is

    A. Secretary of local government
    B. Revenue Collector
    C. Head of personnel management
    D. The Internal auditor of local government
    E. The treasurer of local government

11. Which of the following is **NOT** a function of Pension Funds Custodian?

    A. Receiving the total Contribution remitted by employers on behalf of Pension Fund Administrator
    B. Notify the Pension Funds Administrators within 24 hours of the receipt of contributions from any employer
    C. Hold pension funds and assets in safe custody on trust for the employees and beneficiaries Retirement savings Account (RSA)
    D. Provide data and information on investment to the Pension Fund Administration and the Commission
    E. Collection of capital gain tax on behalf of Federal Inland Revenue Services (FIRS)

12. Which of the following is **NOT** an essential feature of a valid voucher?

    A. The classification
    B. Payment voucher number
    C. Date
    D. Name and address of payee
    E. Internal auditor's address

13. Which of the following is **NOT** a content of Treasury Single Account (TSA) E-payment teller?

    A. Account name of the beneficiary
    B. Purpose of the payment
    C. Amount payable
    D. Account number of the beneficiary
    E. Colour of cheque book

14. Which of the following is **NOT** a factor identified as critical to the success of GIFMIS implementation?

    A. Sustained management support
    B. Dedicated Staff and Consultants
    C. Effective Organisational change
    D. Strong internal and external communication
    E. No need for formalised training program

15. Fiscal Responsibility Act was enacted on the 30ᵗʰ of July 2007 by *………………..* of the Federal Government of Nigeria

    A. National Assembly
    B. Accountant General
    C. Permanent Secretary
    D. World Bank
    E. National Bank

16. The Auditor-General for the Federation works within *……………….* of the receipt of the Accountant-General's financial Statement and submit his report to each house of Assembly.

    A. 30 days
    B. 60 days
    C. 90 days
    D. 100 days
    E. 120 days

17. Which of the following Ministry, Department and Agency (MDA) has representation on the board of Economic and Financial Crime Commission (EFCC)?

    A. Ministry of Education
    B. Federal Ministry of Women Affairs
    C. Ministry of Health
    D. Ministry of Power and Steel
    E. Ministry of Justice

18. An offence punishable by imprisonment or fine or both for an officer to deliberately split contract works, purchases or procurement of service is referred to as

A. Bid security
B. Tender splitting
C. Variation clause
D. Mobilisation fee clause
E. Contingencies clause

19. The technique that requires every item of expenditure to be justified as if the particular activity or programme is taking off for the first time is

A. Traditional/Line items/Incremental budgeting
B. Zero-Based Budgeting' technique (ZBB)
C. Planning, programming and budgeting system (PPBS).
D. Performance budgeting
E. Rolling plan or continuous budgets

20. The process of comparing the actual with budgeted activity, resulting in a variance, which could be favourable or adverse, is

A. Internal Control
B. Budgetary control
C. Zero budgeting
D. Internal Check
E. Annual Estimate

21. A development plan spanning a period of not less or greater than 5 years is called

A. Perspective Plan Budgeting System
B. Planning Program Budgeting System
C. Program Performance Budgeting System
D. Input Budgeting System
E. Input-Output Budgeting System

22. In a Local Government, which of the following has the responsibility to debate, approve and amend the budget

A. Local Government Revenue Committee
B. Auditor-General for Local Government
C. Chairman of the Local Government Council
D. Secretary to the Local Government
E. Local Government Council

23. The Federal government's share out of the Federation Account is further distributed among the following, **EXCEPT]**

    A. Development of Natural Resources
    B. Consolidated Revenue Fund (CRF)
    C. State Governments in Nigeria
    D. Share of Derivation and Ecology
    E. Federal Capital Territory (FCT)

24. Which of the following is responsible for the issuance of Budget Call Circular at the beginning of the 3rd quarter at the federal level?

    A. President
    B. National Assembly
    C. Budget Offices
    D. Ministry of Finance
    E. Accountant – General of the Federation

25. Which of the underlying fundamental principles is **NOT** used in the preparation of financial statements in the public sector?

    A. Consistency of presentation
    B. Accrual basis of accounting
    C. Going concern assumption
    D. Materiality
    E. First-in first-out principle

26. Which of the following is **NOT** a function of the Fiscal Responsibility Commission?

    A. Monitoring and enforcing the promotion of economic objective
    B. Disseminating standard practices of public expenditure, revenue collection, debt control
    C. Undertaking fiscal and financial studies, analysis and diagnosis
    D. Apportioning and approving annual estimate for public institution
    E. Compelling public officer to disclose information relating to public revenue and expenditure

27. Public Procurement Act establishes

   A. Consolidated Revenue Fund (CRF)
   B. Medium-term expenditure framework
   C. National Council on Public Procurement
   D. Operation of Imprest by Cashier
   E. MDAs

28. Which of the following is **NOT** a member of National Council on Public Procurement?

   A. Minister of Finance
   B. Secretary to the Government of the Federation
   C. Minister of Foreign Affairs
   D. Head of Service of the Federation
   E. The Economic Adviser to the President

29. Which of the following best define "Materiality"?

   A. Assessing whether change in accounting date is properly taken care of
   B. Applying a new accounting policy to transactions
   C. Assessing whether an omission or misstatement could influence decisions of users
   D. Assessing the nature of the change in policy
   E. Assessing the quality of materials for production

30. Which of the following administrative tool is used to amend the existing provisions of Financial Regulations?

   A. Finance/Treasury Circular
   B. Financial Regulations
   C. Revised Financial \Memorandum for Local Government, 1991
   D. Medium-Term Expenditure Framework (MTFF)
   E. Fiscal Responsibility Act 2007

SECTION A: PART II   **SHORT-ANSWER QUESTIONS**   **(20 MARKS)**

ATTEMPT ALL QUESTIONS

Write the correct answer that best completes each of the following questions/statements.

1. The segment in the National Chart of Accounts structure for budgeting the type of revenue and expenditure in a particular period, such as salaries, goods and services, transfer and interest due is ……………………..

2. Medium Term Expenditure Framework (MTEF) as a medium term strategic plan of the government is usually prepared for a minimum of ………………………

3. The name of the budget that takes into consideration different levels of output and recognises fixed and variable cost is

4. An entity shall disclose by way of notes to the financial statements the period of the approved budget. **(TRUE or FALSE)**

5. The official FGN Transparency Portal is ………………………

6. The test that ensures that resources are obtained at the cheapest prices is referred to as ………………..

7. The composition of Independent and Corrupt Practice Commission (ICPC) has a Chairman and twelve other members, two of whom shall come each from ………………………

8. The reform conceived by the Federal Government of Nigeria to improve the effectiveness and efficiency in the storage of personnel records and administration of monthly payroll is called ………………………

9. The imprest that must be retired on or before 31st December of the financial year in which they are issued is …………….. while …………….. imprest shall be retired immediately the purpose for which they were granted ceased to exist

10. The government agency that is empowered to collect, control, and manage taxes accruing to federal government is ………………………

11. By Pension Reformed Act 2014, 8% contributions by employees in public services are deducted from …………………………, while 10% contributions by government are charges on…………………………

12. The Directorate of Treasury Inspectorate, of the Office of Accountant General of the Federation shall convene surprise board of survey on cash and bank balances of every ministry and other arms of government at least ………………… times a year

13. In government parastatals, current ratio is obtained by expressing current assets to …………………………

14. A control which measures, evaluates and reports upon the effectiveness of internal control setup in an organisation is known as …………………………

15. Financial Regulation 101 defines …………………………as the Chief Accounting Officer of the receipts and payments of government funds

16. State **TWO** benefits-in-kind

17. An obligation relating to a future transaction which may arise depending on the outcome of a future event is called …………………………

18. Payment made on hire purchase transaction is made up of two parts. They are called…………………… and ………………………

19. International Financial Reporting Standards (IFRS) is to private sector as …………………… is to public sector

20. The Board that issued financial reporting standards for application by public sector entities is the …………….……..

SECTION B: ATTEMPT ANY FOUR QUESTIONS   (50 MARKS)

QUESTION 1

a. The Office of the Accountant General at any tiers of government is the central nerve systems of the government financial activities.

   You are required:

   To enumerate what are the main functions of the Office of the Accountant General of the Federation.

b. The Integrated Payroll and Personnel Information System (IPPIS) payroll consists of financial and non-financial information which reflect the financial contributions made or deductions from an employee pay slip.

You are required:
To state the statutory contributions and non-statutory contribution made from an employee payroll with examples as it contained on his/ her pay slip?

(5 Marks)
(Total 12½ Marks)

QUESTION 2

Justright Ventures, a Parastatal under Aboki State Government is preparing its Cash Flow Statement under direct method, and has provided the following information:

		N
Accounts receivable	01/01/2020	2,500,000
Credit sales in the year		8,000,000
Accounts receivable	31/12/2020	1,500,000
Trade payable	01/01/2020	2,000,000
Purchases in the year (on credit)		4,000,000
Trade payable	31/12/2020	2,100,000
Accrued operating expenses	01/01/2020	500,000
Operating expenses incurred in the year		3,000,000
Accrued operating expenses	31/12/2020	400,000
Depreciation on non-current assets for the year		600,000
Interest on loan	01/01/2020	520,000
Interest charged for the year		400,000
Interest outstanding for the year	31/12/2020	430,000
Non-current asset (Cost)	01/01/2020	150,000,000
Non-current asset (Cost) disposed		149,100,000
Non-current asset (Cost)	31/12/2020	1,800,000
Accumulated depreciation on non-current assets disposed		2,600,000
Loss on disposal of non-current assets		146,300,000
Share capital	01/01/2020	14,000,000
Share capital	31/12/2020	18,500,000
Cash and cash equivalents	01/01/2020	800,000
Cash and cash equivalents	31/12/2020	6,710,000

Required:

a.   Compute the followings:

   i.   Cash received from customers
   ii. Cash paid to suppliers

iii. Cash paid on operating expenses
iv. Payments for non-current assets
v. Cash received on disposal of non-current assets
vi. Additional share capitals
vii. Interest paid on loan

(7 marks)

b.   Prepare statement of cash flow for the year ended December 31, 2020.
(5½ Marks)
(Total 12½ Marks)

QUESTION 3

''The duties and responsibilities of Internal Auditors are at the discretion of management''. In the light of the above statement:

ai   Define Internal Audit   **(2½ marks)**

ii.   Identify **FIVE** areas of interest to an Internal Auditor   **(5 Marks)**

b.   State **FIVE** steps to be taken to foster working relationship with the Internal Auditor in the Public Sector
(5½ Marks)
(Total 12½ Marks)

QUESTION 4

a)   A budget is an economic and financial document. It highlights government's policies which are designed to promote economic growth, full employment and enhance the quality of life of the citizenry.

However, there are some key factors, which militate against efficient and effective budget implementation in the public sector in Nigeria.

Required:
Briefly discus **SEVEN** factors which militate against the budgeting system in the public sector in Nigeria.   **(10 ½ Marks)**

b)   Define budgetary control as related to public sector in Nigeria.
(2 Marks)
(Total 12½ Marks)

QUESTION 5

You are required to state and explain the structure for Budgeting with the National Chart of Accounts (NCOA) and state the steps that should be taken to ensure completeness of using the NCOA.   **(12½ Marks)**

QUESTION 6

Public Financial Management (PFM) has introduced a lot of reforms in the public sector since 2004. One of such reforms is the TSA. In view of this:

Required:

ai.   What is the meaning of the ''TSA''   **(½ Mark)**

ii.   State **Five** roles of service provider in ensuring smooth financial processes

(5 Marks)

b.   TSA is still saddled with some operational and general challenges. State **Seven** of such challenges   **(7 Marks)**
(Total 12½ Marks)

SECTION A - PART 1

MULTIPLE CHOICE SOLUTIONS

1.   D

2.   D

3.   E

4.   B

5.   C

6.   C

7.   C

8.   E

9.   A

10.   A

11.   E

12.   E

13. E

14. E

15. A

16. C

17. E

18. B

19. B

20. B

21. A

22. E

23. C

24. D

25. E

26. D

27. C

28. C

29. C

30. A

Examiner's comment

This part consists of 30 compulsory Multiple-Choice Questions that covered the whole syllabus. About 98% of the candidates attempted the questions and above 80% of them scored about 50% of the total marks obtainable.

The commonest pit fall was as a result of the inability of some candidates to cover the syllabus.

Candidates are advised to make adequate use of the ATSWA study test as well as past questions from previous diets' examinations.

SECTION A - PART II

SHORT ANSWER SOLUTIONS

1.   Economic Segment

2.   Three (3) Years

3.   Flexible Budget/ Activity Based Budget

4.   True

5.   https://www.opentreasury.gov.ng/ /Open-Treasury Portal

6.   Economy test

7.   6, geographical zones of the country

8.   IPPIS

9.   Standing and Special Imprest

10.   Federal Inland Revenue Services (FIRS)

11.   Employee Salary & Consolidated Revenue Fund

12.   3 times

13.   Current Liabilities

14.   Internal Audit

15.   Accountant General of the Federation

16.   i.   Official cars

      ii.   Official Accommodation

      iii.   Official furniture

      iv.   Subscription

      v.   Free interest loan

      vi.   Paid vacation

      vii.   Utilities

      viii. Free meals

17. Contingent Liability

18. Cash Price and Hire purchase Interest

19. International Public Sector Accounting Standards (IPSAS)

20. International Public Sector Accounting Standards Board (IPSASB)

Examiner's comment

This consist of 20 compulsory Short-Answer Questions which covered the entire syllabus. It required the candidates to write correct answer that best completes each of the questions/statements. About 96% of the candidates attempted the questions and over 60% of them scored about 50% of total marks obtainable.

The commonest pitfall was the inability of some candidates to understand the requirements of the questions.

Candidates are advised to prepare well for future examinations and make good use of the ATSWA study text and the past questions from previous diets' examination.

SECTION B

SOLUTION 1

a) **Functions of the Office of Accountant General of the federation**

The functions of the Accountant General of the Federation as contained in Financial Regulations 107 include:

i. Serve as the Chief Accounting Officer for the receipts and payment of the government of the federation.
ii. Supervise the accounts of federal ministries, extra ministerial offices and other arms of government.
iii. Collate, prepare and publish statutory financial statements of the federal government and any other statements of accounts required by the Minister of Finance.
iv. Manage federal government investments.
v. Maintain and operate the accounts of the Consolidated Revenue Fund, Development Fund, Contingencies Fund, and other Public Funds and provide cash backing for the operations of the Federal Government.
vi. Maintain and operate the Federation Account.
vii. Establish and supervise Federal Pay Offices in each state capital of the Federation.

viii. Conduct routine and in-depth inspection of the books of accounts of federal ministries, extra-ministerial offices, and other arms of government to ensure compliance with rules, regulations, and policy decisions of the federal government.

ix. Approve and ensure compliance with accounting codes, internal audit guides and stock verification manuals of federal ministries, extra ministerial offices, and other arms of government.

x. Investigate cases of fraud, loss of funds, assets and store items and other financial malpractices in ministries/extra- ministerial offices and other arms of government.

xi. Provide financial guidelines through the issuance of treasury circulars to federal ministries/extra- ministerial offices and other arms of government to ensure strict compliance with existing control systems for the collection, custody and disbursements of public funds and inventories.

xii. Supervise and control the computerization of the accounting system in the federal ministries, extra ministerial offices, and other arms of government to ensure uniformity.

xiii. Carry out revenue monitoring and accounting, issue officially approved forms bearing Treasury numbers for use in all federal ministries, extra ministerial offices, and other arms of government to ensure uniformity.

xiv. Formulate the accounting policy of the federal government, (p) service public debt and loans, and

xv. Organize training of accounts and internal audit personnel in- all federal ministries, extra-ministerial offices and other arms of government.

b)

i. **Statutory Contributions on Payroll** is a *compulsory contribution from employee payroll to the relevant and appropriate government agencies or organizations and is regulated by legal framework, the objective is to regulate and stabilize the monetary and fiscal policy of the Government.

Examples:

- Pay As You Earns (PAYE) or Personal Income Tax
- National Health Insurance Scheme (NHIS)
- National Housing Funds (NHF)
- Pension Funds Administrator (PFA)

ii. <u>Non-Statutory Contribution on Payroll</u>: is a *willful and voluntary contribution from an employee payroll to the relevant and appropriate third (3rd) party, * it's not regulated by any legal framework.

<u>Examples</u>

- Cooperative Contributions
- Bank Loan Deduction
- Standing Order
- Union Due

Examiner's comment

The question which was divided into two parts with the "a" part testing the candidates' knowledge and understanding of the main functions of the office of the Accountant-General of the Federation, while part "b" required the candidates to state the statutory contributions and non-statutory contributions made from an employee payroll, with examples as it contained on his/her payslip.

About 70% of the candidates attempted the question and about 55% scored above 40% of marks obtainable.

The commonest pitfall was the inability of some candidates to differentiate which deductions constitute statutory contribution and non-statutory contribution.

Candidates are advised to endeavour to cover every area of the syllabus. They should make adequate use of the ATSWA study text and practice the past questions from previous diets' examinations.

SOLUTION 2

a.

(i) **<u>COMPUTATION OF CASH COLLECTED FROM CUSTOMERS</u>** ₦

Accounts Receivable;	01 / 01 / 2020	2,500,000
Add Credit Sales for the Period		<u>8,000,000</u>
		10,500,000
Less Accounts Receivable:	31 / 12 / 2020	<u>(1,500,000)</u>
Cash Collected for the period		<u>9,000,000</u>

(ii)   COMPUTATION OF CASH PAYMENT TO SUPPLIERS   ₦

Trade Payable:	01 / 01 / 2020	2,000,000
Add Credit Purchases for the period		4,000,000
		6,000,000
Less Trade Payable:	31 / 12 / 2020	(2,100,000)
Payments for the Period		3,900,000

(iii)   COMPUTATION OF PAYMENTS ON OPERATING EXPENSES   ₦

Accrued Operating Expenses	01 / 01 / 2020	500,000
Operating Expenses incurred in the period.		3,000,000
		3,500,000
Less: Accrued Operating Expenses:	31 / 12 / 2020	(400,000)
Payment for the Period		3,100,000

(iv)   COMPUTATION OF PAYMENT FOR NON- CURRENT ASSET   ₦

Non-Current Assets (at cost)	01 / 01 / 2020	150,000,000
Non –Current Assets Disposed (at cost)		(149,100,000)
		900,000
Addition of Non-Current Assets (Balancing figure)		900,000
Non-Current Assets	31 / 12 / 2020	1,800,000

(v) **COMPUTATION OF AMOUNT COLLECTED ON DISPOSAL ON NON-CURRENT ASSET**   ₦

Non – Current Assets Disposed (at cost)	149,100,000
Less Accumulated Depreciation on Disposal	(2,600,000)
Net book Value	146,500,000
Less Loss on Disposal	(146,300,000)
Amount Received on Disposal	200,000

(vi) **COMPUTATION OF INTREST PAYMENT ON LOAN**   ₦

Loan Interest Outstanding	01 / 01 / 2020	520,000
Loan Interest Charged for the period		400,000
		920,000
Less Loan Interest outstanding	31 / 12 / 2020	(430,000)
Interest paid on Loan		490,000

(vii) **COMPUTATION OF ADDITIONAL SHARE CAPITAL**   ₦

Share Capital	01 / 01 / 2020	14,000,000
Additional Issued Share Capital (Balancing figure)		4,500,000
Share Capital	31 / 12 / 2020	18,500,000

b.   **JUSTRIGHT VENTURES**

CASHFLOW STATEMENT FOR THE YEAR ENDED 31ST DECEMBER, 2020

CASH FLOW FROM OPERATING ACTIVITIES   ₦   ₦

Cash Received from Customers	9,000,000	
Cash Paid to Suppliers	(3,900,000)	
Cash Paid for Operating Expenses	(3,100,000)	
Net Cash Flow from Operating Activities (A)		**2,000,000**

CASH FLOW FROM INVESTMENT ACTIVITIES

Purchase of Non – Current Assets	(900,000)	(Bonus mark)
Proceeds from sale of Non – Current Assets	200,000	
Net Cash Flow from Investment Activities (B)		(700,000)

CASH FLOW FROM FINANCING ACTIVITIES

Share Issued	4,500,000	
Interest Paid on Loan	(490,000)	
Net Cash Flow from Financing Activities (C)		**4,010,000**
Changes in Cash and Cash equivalent = (A + B +C)		5,310,000
Cash and Cash equivalent as at 01 / 01 / 2020		**800,000**
Cash and Cash equivalent as at 31 / 12 / 2020		**6,110,000**

Examiner's comment

The question tested candidates' knowledge and understanding of the preparation of cash flow statements using direct method as provided in the information provided. Many candidates avoided this question as only about 50% of them attempted the question. Performance was fair as only about 40% of the candidates that attempted it managed to score about 40% of marks obtainable.

The commonest pitfall was the ill-preparation of many of the candidates for the examination.

Candidates are advised to prepare well for future examination. They should endeavour to cover every area of the syllabus, and they should familiarize themselves with the past questions of previous diet examinations.

SOLUTION 3

a.

    i.   Internal audit is an independent appraisal activity within an organisation for the review of accounting, financial and other operations as basis for services to management. An individual designated as the Internal auditor carries out the control process.

    ii.

        i.   Pre – Audit
        ii.   Vouching of payroll and third-party claims
        iii. Auditing of store movement and records
        iv. Conducting internal investigations and evaluation for management
        v.   Constant review and appraisal of the existing internal control measures

b.   Steps to be taken to foster relationship

    i.   Allocate responsibility for establishing and maintaining an effective relationship with internal audit unit.

    ii.   Arrange liaison meetings with Internal audit on a regular basis say half yearly to agree on important decisions, mutual discussions of audit plan in order to avoid unnecessary duplication of effort.

    iii. Check all internal audit report and the internal audit working paper.

    iv. Seek to agree areas where reliance can be specifically placed on Internal work which could form certification audit of an account.

    v.   Discuss shortcomings in internal audit unit within the Organisation.

    vi. Where Internal Audit is required to cooperate and assist the exit auditor in making available work plan, audit programs, details of work done and audit report.

Examiner's comment

The question tested the candidates' knowledge and understanding of the duties and responsibilities of the Internal Auditor. About 60% of the candidates attempted the question. And only about 50% of them scored above 40% of marks obtainable.

The commonest pitfall was the inability of some candidates to understand the areas of interest to an Internal Auditor and the necessary steps to foster working relationship with the Internal Auditor in the public sector.

Candidates are advised to make adequate use of the ATSWA study text as well as to familiarize themselves with the past questions of previous diet examinations.

SOLUTION 4

A. **Factors, which militate against the budgeting system in the public sector in Nigeria**

The key factors, which militate against efficient and effective budget implementation in the public sector are as follows:

a) Human element

Top management members see budgeting as restraining and challenging. They tend to develop a lot of apathy towards its adoption and implementation. The lack of probity and accountability of some operatives affect successful budgeting.

b) Uncertainties underlying data inputs

There are a lot of uncertainties in the data used for the budget preparation. The projections in revenue accruing from oil may not be forthcoming in view of the vagaries in the world market. Lack of efficient database also hamstrings reliable forecasts.

c) The type of project for which budget is prepared

How successful a budget will be depends on the type of project to which it relates. Some projects are popular while others are not. Those which are not popular may face stiff implementation problems.

d) The problem of inflation

Inflation tends to reduce the purchasing power. When the value of money is falling, budget implementation may run into problems. The revenue available will not be able to cover the expenditure.

e) Political, social and cultural elements

Each segment of the nation has its own cultural beliefs and taboos, which may take time to change. Introducing innovation may be met with stiff opposition. For example, a section of the country may not be willing to provide land for development purposes. Secondly, where there is political instability, budget implementation is at risk.

f) Changing government policies

To implement a budget, a lot depends on the policy of government. For effective budget implementation, government policies have to be harmonised and consistent. Frequent changes of government policies affect budget implementation.

g) The problem of debt management and optimal use of limited resources

There is the challenge of striking a balance between which parts of the nation's resources should be used for servicing debts and the amount that should be utilised for economic development.

h) Low agricultural output

Agricultural output is fast dwindling because the method of farming is outdated and the younger population is not attracted. The resources that should be used for economic development are therefore being diverted to the importation of food items.

i) Fiscal indiscipline

Most government officers are always maximising their budget. Under the incremental budgeting system, they tend to expend the last naira available in a year's budget in order to justify the demand for increase allocation in the subsequent year, with little or nothing to show as a proof of what has happened in the current year.

B. Definition of budgetary control as related to Public Sector in Nigeria

It is the whole system of controls - financial or otherwise - to ensure that income and expenditure are in line with the budget and that wastage is reduced to the barest minimum. Budgetary control is a positive and integral part of a public sector organization's planning and appraisal activities so as to achieve the set objectives. In other words, budgetary control is a process of comparing the actual with budgeted activity, resulting in a variance, which could be favorable or adverse.

Examiner's comment

The question tested the candidates' knowledge and understanding of factors that militate against the budgeting system in the public sector as the definition of budgetary control as related to public sector in Nigeria. About 60% of the candidates attempted the question and about 50% of them scored above 40% of marks obtainable.

The commonest pitfall was the inability of some candidates to identify the factors which militate against the budgeting system in the public sector. They were able to define budgetary control.

Candidates are enjoined to cover every areas of the syllabus and to make use of the study text and previous diets' past questions.

SOLUTION 5

National Chart of Accounts structure for budgeting

i.   **Administrative segment** - The administrative classification identifies the entity that is responsible for the public funds projection–such as the Ministry of Education, Health and Women Affairs or, at a lower level, schools and hospitals.

ii.   **Economic segment** - The economic classification identifies the type of revenue and expenditure budgeted in a particular period, examples are salaries, goods and services, transfer and interest due.

iii.   **Functional segment** – The functional classification or classification by functions of government is a detailed classification of the functions or socio-economic objectives, that general government units aims to achieve through various outlays. It therefore, organizes government activities according to their broad objectives or purposes.

iv.   **Programme segment** - The programme classification identifies various set of activities to meet specific policy objectives of the government e.g. Pre-primary education, poverty alleviation and food security.

v.   **Funds segment**- The fund classification identifies the sources of funding government activities.

vi.   **Geographical segment**- The geographical classification is used to identify the geographical location of an entity (MDAs) or a project so that an analysis of government budget along various zones, states and local government areas in the country can be done.

Steps for budgeting with National Chart of Accounts

All the six segments of the chart of accounts must be completed on the budget entries, even if the value for a given segment is inactive. Only numeric values can be

budgeted. The following steps should be followed when using the Chart of Accounts for budgeting:

i.   Identify the government institutions (cost and revenue centers) from the hierarchy of administrative land codes provided in the chart of accounts.

ii.   Identify the economic items that would be executed during the fiscal year.

iii.   Identify the functions intended to be performed by government institutions (revenue and cost centers).

iv.   Identify the programmes intended to be carried out by the government institutions.

v.   Determine the sources of financing the budgeted amount for each budget line; and

vi.   Identify the planned location for the economic transactions or government institutions.

Examiner's comment

The question tested the candidates' knowledge and understanding of the structure for budgeting with the National Chart of Accounts (NCOA) as well as the steps to be taken to secure completeness of using the NCOA. Many candidates avoided this question as only about 40% of them attempted it. About 30% of them scored about 40% of marks obtainable.

The common pitfall was the inability of many candidates to understand the structure of budgeting under the NCOA.

Candidates are required to make adequate utilization of the ATSWA study text and other relevant textbooks to boost their knowledge. Candidates are also required to practice with the previous diets' past questions.

SOLUTION 6

a)

i.   Treasury Single Account: is a public accounting system under which all government revenue, receipts and income are collected into one single account, usually maintained by the country's central bank and all payments done through this account as well.

ii.   Roles of service provider

   • To work with the Central Bank of Nigeria, Office of the Accountant General of the Federation and other stakeholders to articulate system requirements
   • To provide a robust stable and effective integrated processing platform

- To ensure the optimal availability of all relevant systems and platforms
- To provide effective and efficient support to users of the platform
- To provide users with relevant support
- Training of users on the use of the payment gateway

b) **GENERAL AND OPERATIONAL CHALLENGES**

(i) Fees charged by service providers which are deducted at source are not provided for in the budget.

(ii) Lack of unified service agreement among stakeholders

(iii) Some MDAs still maintain hidden commercial bank accounts

(iv) Connectivity issues

(v) Infrastructure incentives and logistics

(vi) Funding

(vii) Capacity gap of users

(viii) Inadequate sensitisation

(ix) Different platforms e.g, Remita, GIFMIS, NIBBS

(x) Treatment of donor funds through TSA

(xi) Incessant transfer of funds from TSA to commercial bank accounts in the name of counterpart funding associated with project accounts by MDAs.

(xii) Delay by CBN in generating MDA reports

(xiii) Poor accounting reconciliation system

(xiv) Inadequate controls at the bank end

(xv) Unwillingness to comply by the MDAs and government parastatals / poor implementation

Examiner's comment

The question tested the candidates' knowledge and understanding of the Treasury Single Accounts, and the roles of service provider in ensuring smooth financial processes as well as challenges of TSA. About 60% of the candidates attempted the question, and about 50% scored above 40% of marks obtainable.

THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
SEPTEMBER 2022 EXAMINATIONS (PART II)
QUANTITATIVE ANALYSIS

PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER

EXAMINATION INSTRUCTIONS

1. All solutions should be in ink. Any solution in pencil will not be marked.

2. Read all instructions on each part of the paper carefully before answering the questions.

3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**

4. Check your pockets, purse and mathematical sets, etc to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.

5. Do not enter the hall with anything written on your docket.

6. Insert your examination number in the space provided above.

WEDNESDAY, 28 SEPTEMBER, 2022

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO
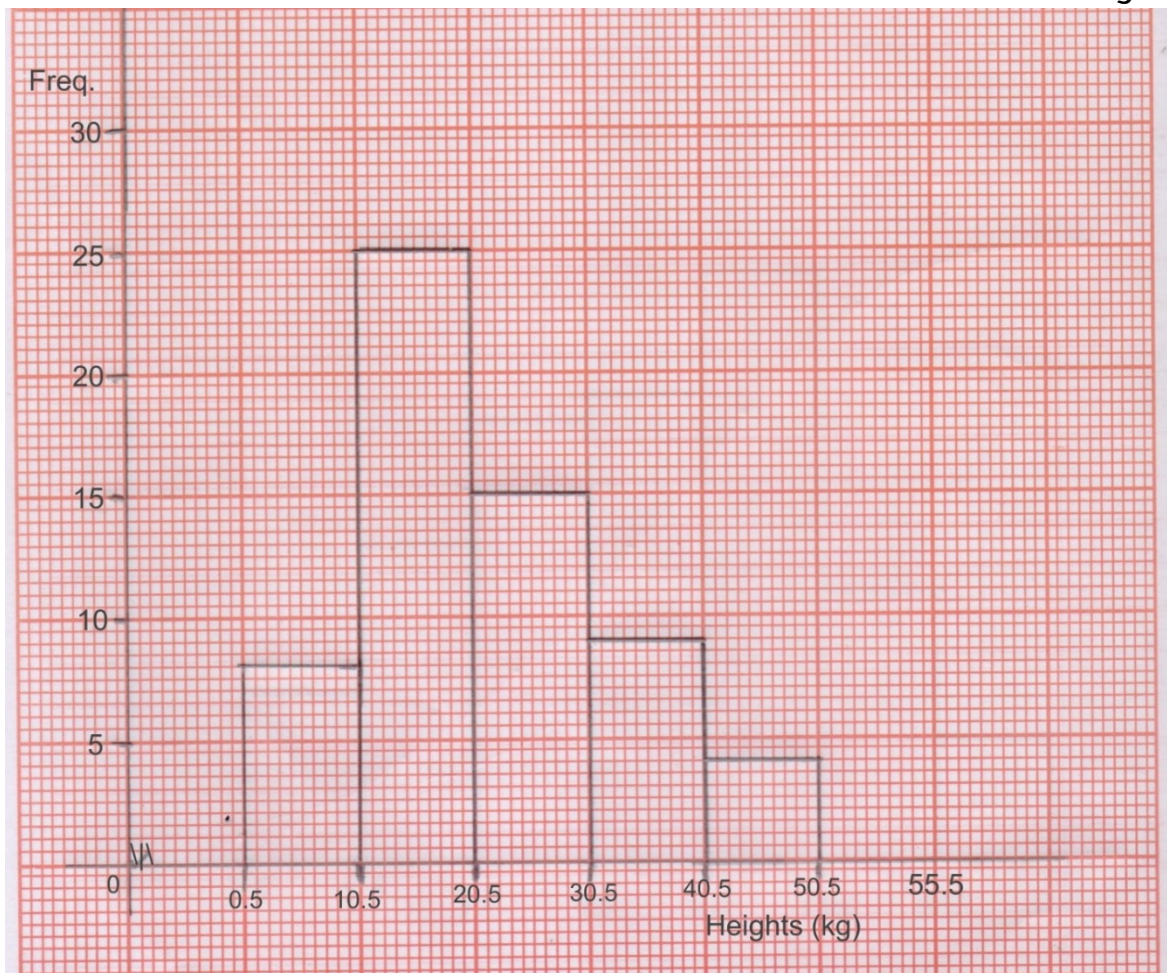
QUANTITATIVE ANALYSIS

Time Allowed: 3 hours

SECTION A: PART I   MULTIPLE-CHOICE QUESTIONS   (30 Marks)

ATTEMPT ALL QUESTIONS

Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements:

1. Estimate   the   mode   of   the   distribution   shown   in   the   histogram:

A. 15.6
B. 16.2
C. 16.5
D. 19.5
E. 20.5

2. A method, good for a time series,that reveals linear trends,is known as

A. Semi-Averages method
B. Moving Average method
C. Free-hand method
D. Least Squares method
E. Experimental Smoothening method

3. In testing the statistical hypothesis, which of the following statements is **NOT** true?

A. The level of significance is the maximum probability of the willingness to risk a type I error
B. A hypothesis, which states that there is no difference between the procedures or results from samples and other phenomenon, is called alternative hypothesis
C. The computed value, which when compared with the tabulated value, enables one to decide whether to accept or reject hypothesis, is called test statistic
D. Testing H_0: $\mu = 25$ against H_1: $\mu \neq 25$ leads to two-tailed or two-sided test.
E. $(1 - \alpha)$ is the probability associated with level of confidence

4. Which of the following statements is **NOT** correct?

A. A sample consists of any fraction of the population
B. Sampling unit is any individual member of a population
C. The sampling fraction, in usual notation, is expressed as n/N
D. Sampling survey is a list containing all the items or units in the target population
E. A population is a collection or group of items satisfying a definite characteristic

5. The following table shows the unit prices and quantities of items purchased in 2020 and 2021:

| Item	2020		2021	
	Price	Quantity	Price	Quantity
Milo	2.0	3	2.5	5
Sugar	2.5	4	3.0	6
Malt	3.0	2	2.5	3

Use the year 2020 as the base year to determine Laspeyre index.

A. 100.18
B. 111.36
C. 121.63
D. 187.50
E. 208.81

6. When cross-tabulating two variables in SPSS, it is conventional to

A. Represent the independent variable in rows and the dependent variable in columns
B. Assign both the dependent and independent variables to columns
C. Represent the dependent variable in rows and the independent variable in columns
D. Assign both the dependent and independent variables to rows
E. Assign both the categorical data and nonnumeric data to tab

7. Data derived from existing published or unpublished records of government agencies, trade associations, research bureaus, magazines and individual research work are known as

A. Raw data
B. Primary data
C. Tertiary data
D. Secondary data
E. Common data

8. Find the median of the given set of numbers: 3, 7, 4, 8, 9, 6, 10, 12, 13, 15.

A. 7.5
B. 8.5
C. 9
D. 9.5
E. 10

9. The following data consist of the time taken (in minutes) to complete a homework by nine students: 54, 55, 48, 39, 46, 56, 39, 51,44.

Find the coefficient of variation

A. 12.81%
B. 22.94%
C. 78.05%
D. 78.71%
E. 87.71%

10. The nature of correlation shown in the following figure is described as
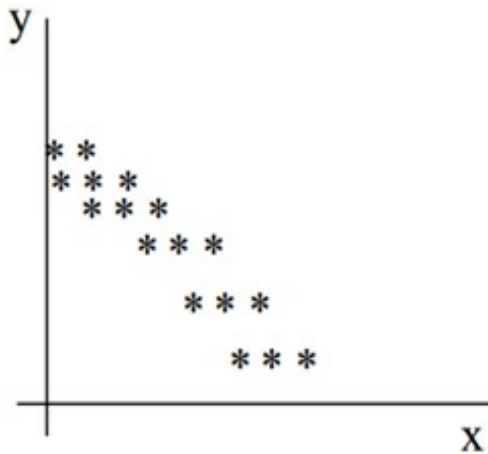
A. Positive correlation
B. Perfect positive correlation
C. Negative correlation
D. General correlation
E. Zero correlation

11. Two persons X and Y appear in an interview for two vacancies in the same post, the probability of X's selection is 1/5 and that of Y's selection is 2/5.What is the probability that only one of them will be selected?

A. 3/25
B. 8/25
C. 11/25
D. 12/25
E. 10/11

12. The diagram below shows the ogive of the scores obtained by 50 students in a QA test. The estimates of the median and the upper quartile of the distribution are, respectively,
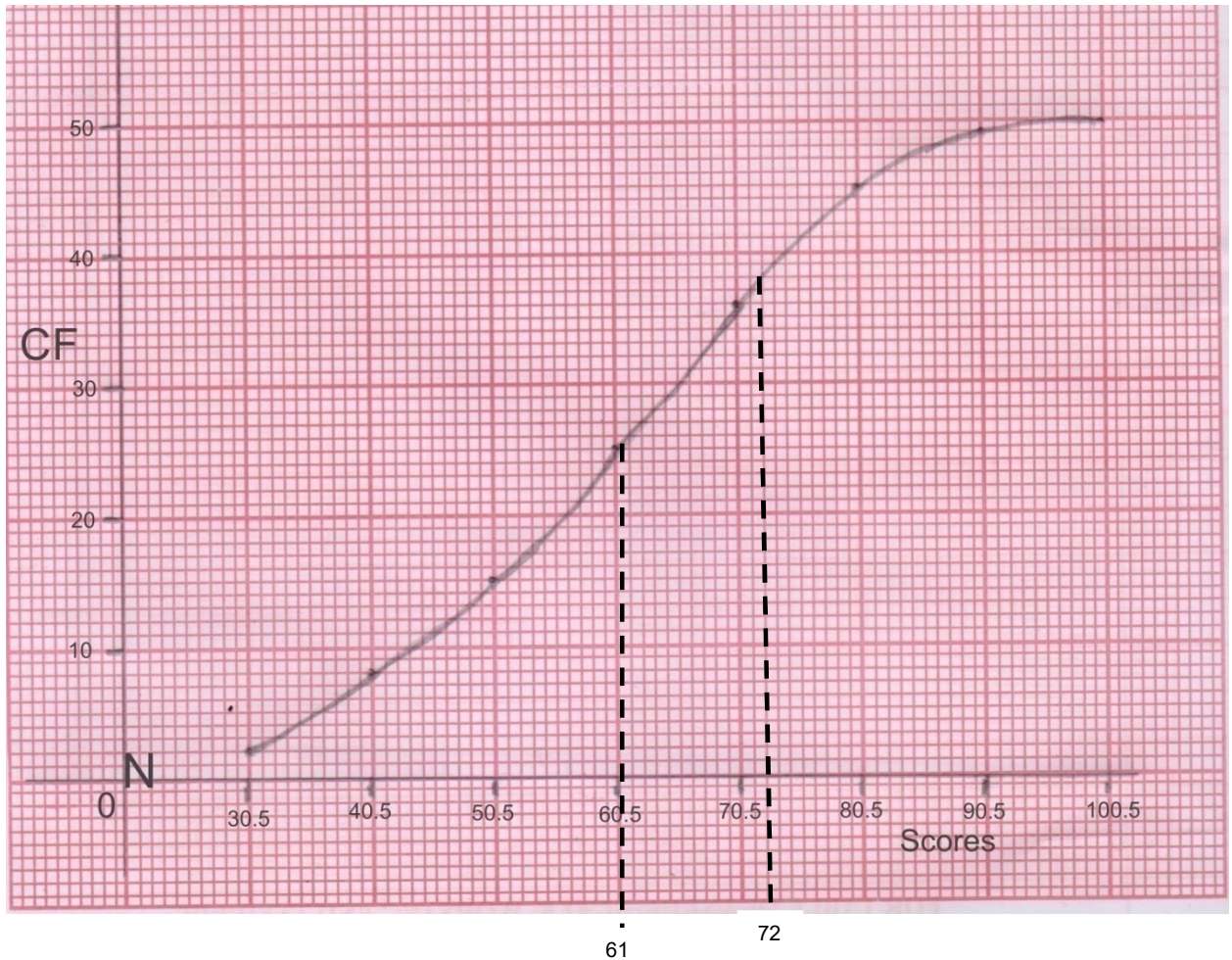
A. 50.5 and 70.5
B. 60 and 70
C. 60 and 71
D. 61 and 72
E. 61 and 74

13. Consider the following linear programming problem:

Maximize $4x + 10y$

Subject to: $3x + 4y \leq 480$

$4x + 2y \leq 360$

$x, y \geq 0$

59

The corner points of the boundary of the feasible region are (48,84), (0,120), (0,0), and (90,0). What is the maximum possible profit for the objective function?

A.   360
B.   1032
C.   1200
D.   1600
E.   2592

14.   In a network diagram, two different activities must not have the same

A.   Starting and finishing nodes
B.   Preceding activity
C.   Starting nodes
D.   Finishing nodes
E.   Duration

15.   A transistor in a digital computer is used by a company in large quantities. The information in the following table has been collected monthly on failures of the transistors:

Month	1	2	3	4
Percentage of failures	25	30	35	10

The total number of transistors in use is 1000 units. Calculate the number of transistors failing at the end of the 3rd month, if group replacement plan is considered.

A.   250
B.   363
C.   516
D.   550
E.   613

16.   Which of the following best explains the objective of transportation model?

A.   To transport a single commodity or goods from various/origins to different destinations timely and in conformity with accounting rules
B.   To transport a single commodity or goods from various/origins to different destinations with maximum consumer's satisfaction
C.   To ensure timely supply of a single commodity or goods to consumers at different locations

17. In the table, three sources S_1, S_2 and S_3 with the production capacities of 19 units, 37 units, 34 units of product respectively are as given. Every day, the demand of four retailers T_1, T_2, T_3 and T_4 is to be furnished with at least 16 units, 18 units, 31 units and 25 units of product respectively. The transportation costs (in thousands of Naira) are also given in the matrix. Calculate the minimum transportation cost for the transportation problem using North-west corner method.

Source	T_1	T_2	T_3	T_4	Supply
S_1	5	3	6	2	19
S_2	4	7	9	1	37
S_3	3	4	7	5	34
Demand	16	18	31	25	

A.   ₦480
B.   ₦580
C.   ₦58,000
D.   ₦480,000
E.   ₦580,000

18. Technique used to imitate the operation of a real-world process of system over time prior to actual performance is known as

A.   Inventory control
B.   Simulation
C.   Game theory
D.   Integrated Production Model
E.   Aquatic demonstration

19. The following table gives the unit transportation costs (in thousands of Naira) of a particular product from three factories (X, Y, Z) to three warehouses (A, B, C) with the warehouse requirements and factory capacities:

| Factories	Warehouses			Factory capacities
	A	B	C	
X	6	8	10	150
Y	7	11	11	175
Z	4	5	12	275
Warehouse Requirements	200	100	350	

Use the Vogel's approximation method to identify the cell and its allocation at the end of the first iteration based on penalty factors.

A. Cell (1, 3); Allocation is 150
B. Cell (2, 1); Allocation is 175
C. Cell (3, 1); Allocation is 200
D. Cell (4, 1); Allocation is 50
E. Cell (4, 3); Allocation is 50

20. At every iteration of simplex method for minimisation problem, a variable in the current basis is replaced with another variable that has

A. a positive $Z^* = C_j - Z_j$ value
B. $Z^* = C_j - Z_j = 0$
C. a negative $Z^* = C_j - Z_j$ value
D. $Z^* = C_j - Z_j$ being a positive integer
E. $Z^* = C_j - Z_j$ being a prime integer

21. The following equipment/items do not deteriorate gradually but fail suddenly, **EXCEPT**

A. Electric bulbs
B. Contact set used by vehicles
C. Highway tube lights
D. Resistors in radio
E. Trailer

22. The amount by which the objective function decreases (or increases) as a result of availability of one unit less or more of the limited resources is known as the .... of binding constraints.

A. Unit price
B. Total cost
C. Total price
D. Shadow price
E. Primal price

23. Which of the following is the simplest but most inaccurate method of obtaining the initial basic feasible solution to transportation problems?

   A.   North-West corner Method
   B.   Vogel's Approximation Method
   C.   Least Cost Method
   D.   Hungarian Method
   E.   Monte Carlo Method

24. Which of the following statements is **NOT** true about inventory?

   A.   Inventory includes raw materials, partly finished products or finished products
   B.   The three major motives for inventory taking are transaction, precautionary and speculative motives
   C.   The list of items in an inventory includes machines
   D.   Inventory refers to the list of consumable tools available in an organisation
   E.   The main objective of inventory control is to maintain inventory levels so as to minimise the total inventory costs

25. Consider an exponential function given by $y = a^x$, where a is the base and x is the exponent. If the base a is less than 1, then y becomes

   A.   A logarithmic function
   B.   A non-linear growing function
   C.   An exponentially growing function
   D.   An exponentially decaying function
   E.   An implicit function

26. Which of the following is **NOT** true about the slope of a line?

   A.   It is constant at any point on the line
   B.   It is also called rate of change
   C.   It is the change in y coordinate with respect to the change in x coordinate
   D.   Its value must always be negative
   E.   It is also referred to as the gradient of the line

27. If the demand function for a certain product is given as $p = 100q - 2q^2$, where p is the price and q is the quantity produced and sold. Determine the price elasticity of demand at $q=20$.

A. 0.5
B. 1.0
C. 1.5
D. 2.0
E. 3.0

28. A financial group intends to make an investment of ₦70m now and expects to receive ₦95million in 4 years' time. The internal rate of return (IRR) is

A. 7.9%
B. 10.79%
C. 13.57%
D. 35.7%
E. 87.3%

29. A dealer purchased a washing machine for ₦110,000. After allowing a discount of 12% on its marked price, he still gains 10%. Find the marked price of the washing machine.

A. ₦121,000.00
B. ₦127,500.00
C. ₦132,000.00
D. ₦137,500.00
E. ₦140,084.86

30. The Venn diagram shows the number of consumers who purchased Coffee (C), Wine (W) and Beer (B) in a village. There were 166 consumers altogether. Find the number of consumers who purchasedall the three beverage drinks.
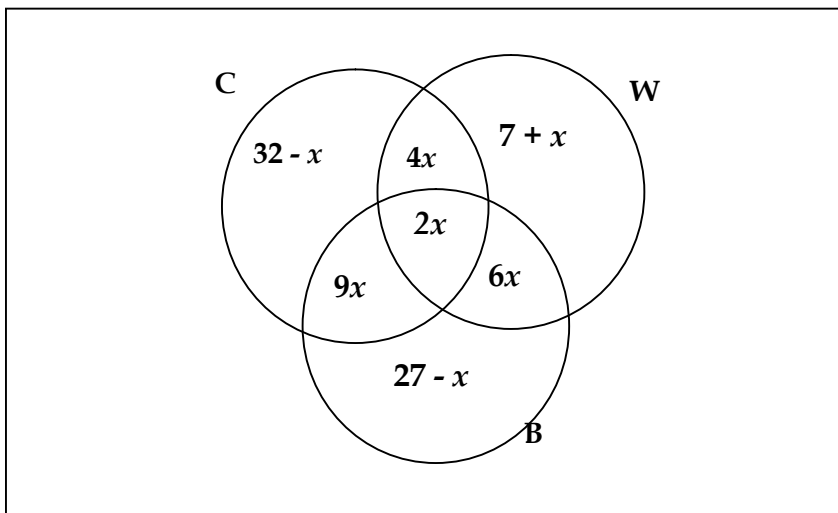
A. 5
B. 7
C. 10
D. 56
E. 85

SECTION A: PART II SHORT-ANSWER QUESTIONS (20 Marks)

ATTEMPT ALL QUESTIONS

Write the correct answer that best completes each of the following questions/statements

1. A histogram consists of ……….. drawn to represent a group frequency distribution with the rectangles touching each other; while the graph obtained by joining the mid-points of the top of the rectangles is called ………………

2. The following are the data collected on the ages (in years) of the people living in a particular settlement in Lagos State:

Class interval	10 – 20	20 - 30	30 - 40	40 - 50	50 - 60	60 – 70
Frequency	10	20	6	8	4	2

The mean age of the people is ………………

3. If the arithmetic mean and variance of a data set are 7 and 36 respectively, then the coefficient of variation for the same data set is …………

4. With respect to population size, the condition under which a t-test is applicable to test for equality of means is ………………………………

5. The following table shows the marks obtained by five students in Quantitative Analysis (QA) and Information Technology (IT).

QA marks (x)	70	65	63	62	55
IT marks (y)	50	52	56	59	61

If d is the arithmetical difference between the ranks of x and y respectively, then $\sum d^2$ is ………………………

6. If a coin and a six-sided-fair die are tossed together, then the number of elements in the sample space is …………………

7. In the method of ………………, the given series is divided into two equal parts (halves) and the average (arithmetic mean) of each part is plotted at the mid-point of their time duration.

8. Use the following pieces of information given below to compute the Marshall – Edgeworth index:

$\sum P_0 q_0 = 134, \sum P_0 q_1 = 133, \sum P_1 q_0 = 157$ and $\sum P_1 q_1 = 168$

9. If the universal set $U = \{5, 10, 20, 50, 100, 200, 500, 1000\}$, A = $\{5, \ 20, \ 100, \ 500\}$ and B = $\{10, 50, 200, 1000\}$, then the intersection of the complements of A and B is …………..

10. The marginal cost function (in Naira) of a production company is given by $MC = 3q^2 + 2q - 1$, where q is the quantity of items produced and sold. The total cost (in Naira) of producing 20 units of items is ………..

11. A small enterprise spends Le2.4m to set up a factory from where some items are produced. It costs Le750 to produce an item and the sales price of each item produced is Le1,950. The quantity of items to be produced at breakeven is ………..

12. The derivative of the function $(3x - 5)(4x + 3)$ at the point $x = 1$ is ……………

13. An assignment model can be viewed as a special case of transportation problem in which the .... and destination capacities are being equated to ....

14. A dealer sells a particular model of washing machine for which the probability distribution of daily demand is as given in the following table.

Demand/day	4	5	6	7	8
Probability	0.05	0.25	0.30	0.25	0.15

If the following 10 random numbers: 68, 47, 92, 76, 86, 46, 16, 28, 35, 54 were selected to simulate a ten-day period, then the demand forecast for the sixth day, using Monte Carlo's stimulation method, is ....

15. The following table gives the unit transportation costs (in thousands of Naira) from various suppliers to the various points of consumption:

| Supplier | Consumer | | | |
	X	Y	Z	Supply
A	5	6	4	60
B	8	3	9	50
C	4	8	3	70
Customer Needs	70	80	30	

The minimum transportation cost, calculated by using the Least Cost Method, is ....

16. In the periodic review and reorder level systems of inventory, stock levels are reviewed at .... and .... time intervals, respectively.

17. While solving a linear programming problem graphically, the area bounded by the constraints is called ....

18. A transportation problem is said to be .... if the total supply from all the sources is not equal to the total demand of all destinations.

19. One of the assumptions of Economic Order Quantity (EOQ) is that stock holding cost is .... and ....

20. A factory is planning to manufacture a product. Its Research Department has indicated that there is a 67% of HIGH SALES (H) for the product and a 33% of LOW SALES (L). The random number ranges to represent H and L are respectively .... and ....

SECTION B: ATTEMPT ANY FOUR QUESTIONS IN THIS SECTION(50 MARKS)

QUESTION 1

The following table shows the unit prices (₦'000) and quantities of items required by a household during the period of years 2020 and 2021:

Commodity / Item	2020		2021	
	Price	Quantity	Price	Quantity
A	300	18	400	15
B	500	6	500	9
C	400	20	600	26
D	100	14	300	15
E	800	5	100	4

Use the year 2020 as the base year to determine

a.   Simple Aggregate Price Index;   (2½ Marks)

b.   Paasche Index; and   (5 Marks)

c.   Fisher's Ideal Index.   (5 Marks)
                                                        (Total 12½ Marks)

QUESTION 2

The following table shows the yearly sales volume (L$'000,000) of A-Z Liberia Limited for 10 years:

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sales	70	80	96	100	95	114	120	123	140	153

You are required to:

a.   Use the method of Least Squares to fit a regression line for the data above

                                                        (8½ Marks)

b.   Calculate the trend values   (2½ Marks)

c.   Estimate the likely sales volume for the year 2022.   (1½ Marks)
                                                        (Total 12½ Marks)

QUESTION 3

The frequency table below shows the time taken for 80 people to travel to an event.

Time Interval (minutes)	Frequency
20 – 24	3
25 – 29	8
30 – 34	17
35 – 39	29
40 – 44	15
45 – 49	6
50 -54	2

You are required to:

a. Construct a cumulative frequency curve for the distribution   (6½ Marks)

b. Estimate the median, semi-interquartile range and 75th percentile
    from the curve.   (6 Marks)
                                                          (Total 12½ Marks)

QUESTION 4

A company manufactures two types of dress: ball gown and T-shirt by using materials and labour hours. A ball gown requires 2 units of material and 1 hour of labour while a T-shirt requires one unit of material and 1 hour of labour. 100 units of materials and 80 hours of labour are available per week. The company can produce at most, 40 ball gowns.

A ball gown makes a contribution of ₦3,000 and a T-shirt a contribution of ₦2,000.

You are required to:

a. Formulate the above linear programming problem to maximise the
    contributions;   (3½ Marks)

b. Use graphical method to determine the number of units of both types of dress to
    be produced so as to maximise the company's profit;   (6½ Marks)

c. Obtain the shadow cost for one unit of materials.   (2½ Marks)
                                                          (Total 12½ Marks)

QUESTION 5

a.   First-Class Consultancy Nigeria Limited makes use of the concept of Economic Order Quantity (EOQ) to estimate the order quantity for its various parts and is currently planning its orders. The data available for the analysis are as displayed below:

Annual consumption	73,500
Cost to place one order	GH¢2,000
Cost per unit	GH¢80
Carrying cost	7.5% of the unit cost

You are required to calculate the:

i.	Economic Order Quantity (EOQ);	(1½ Marks)
ii.	Number of orders per year;	(1½ Marks)
iii.	Ordering Cost;	(1½ Marks)
iv.	Carrying Cost;	(1½ Marks)
v.	Total Cost of Inventory	(1½ Marks)

b.   The normal, minimum and maximum usages of an inventory are 2,500 units, 750 units and 2,050 units, respectively. The lead-time varies between 9 and 12 weeks and the Economic Order Quantity (EOQ) is 45,000 units. Calculate the re-order and maximum levels.   (5 Marks)

(Total 12½ Marks)

QUESTION 6

The previous data from a queuing system gave the following pattern of inter-arrival durations and service durations with the accompanied probabilities:

Inter-arrival time		Service time	
Minutes	Probability	Minutes	Probability
1	0.20	1	0.19
3	0.25	3	0.21
5	0.30	5	0.30
7	0.14	7	0.18
9	0.11	9	0.12

By using the following random numbers: 32, 37, 60, 70, 78, 61, 63, 53, 33, 47, for arrival and 63, 26, 02, 99, 08, 84, 48, 25, 93, 68 for service.

You are required to:

(a) Simulate the queue behaviour for a period of 60 minutes;   (9½ Marks)

(b) Estimate the following (assuming service starts by 11:00 am):

      i.   Average queue length;   (½ Mark)
      ii.   Average waiting time of customers before service;   (½ Mark)
      iii.   Average service idle time;   (½ Mark)
      iv.   Average service time;   (½ Mark)
      v.   Time a customer spends in the system;   (½ Mark)
      vi.   Probability of the service being idle   (½ Mark)

(Total 12½ Marks)

FORMULAE

Sample variance, $s^2 = \dfrac{\sum (x - \bar{x})^2}{n-1}$

Economic Order Quantity

$Q = \sqrt{\dfrac{2cd}{n}}$

$Z_{cal} = \dfrac{\bar{x} - \mu}{\dfrac{\sigma}{\sqrt{n}}}$

Slope of a regression equation

$b = \dfrac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$

Elasticity of demand, $e = \left(-\dfrac{p}{q}\right)\left(\dfrac{dq}{dp}\right)$

The 95% confidence interval for μ

$= \bar{x} \pm t_{\alpha, n-1} \dfrac{s}{\sqrt{n}}$

The trend equation, y = a + bt, where t = x_i - x_m

$b = \dfrac{\sum ty}{\sum t^2}$, a = $\bar{y} - bx_m$, x_m = median of x values

$SARPI = \dfrac{\sum \left(\dfrac{P_n}{P_o} \times 100\right)}{N}$

$SAPI = \dfrac{\sum P_{ni}}{\sum P_{oi}} \times 100$

$t = \dfrac{p}{\sqrt{\dfrac{pq}{n}}}$

EOQ with stock-out

$$Q = \sqrt{\frac{2cd}{h}} \times \sqrt{\frac{h + c_s}{c_s}}$$

$$LPI = \frac{\sum p_1 q_o}{\sum p_o q_o} \times 100$$

$$Z = \frac{p - \hat{p}}{\sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}}$$

$$Q_i = L_{Q_i} + \left(\frac{\frac{iN}{4} - \sum f_{Q_i}}{f_{Q_i}} \right) c$$

$$D_i = L_{D_i} + \left(\frac{\frac{iN}{10} - \sum f_{D_i}}{f_{D_i}} \right) c$$

$$P_i = L_{P_i} + \left(\frac{\frac{iN}{100} - \sum f_{P_i}}{f_{P_i}} \right) c$$

Spearman's rank correlation coefficient

$$r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

EOQ with gradual replenishment

$$Q = \sqrt{\frac{2cd}{h\left(1 - \frac{d}{r}\right)}}$$

$$\text{Length of Inventory cycle} = \frac{Q}{d}$$

$$\text{Number of } production\ runs = \frac{d}{Q}$$

$$Production\ cost = Ordering\ cost + Holdering\ cost$$

$$Mode = L_{mo} + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2} \right) c$$
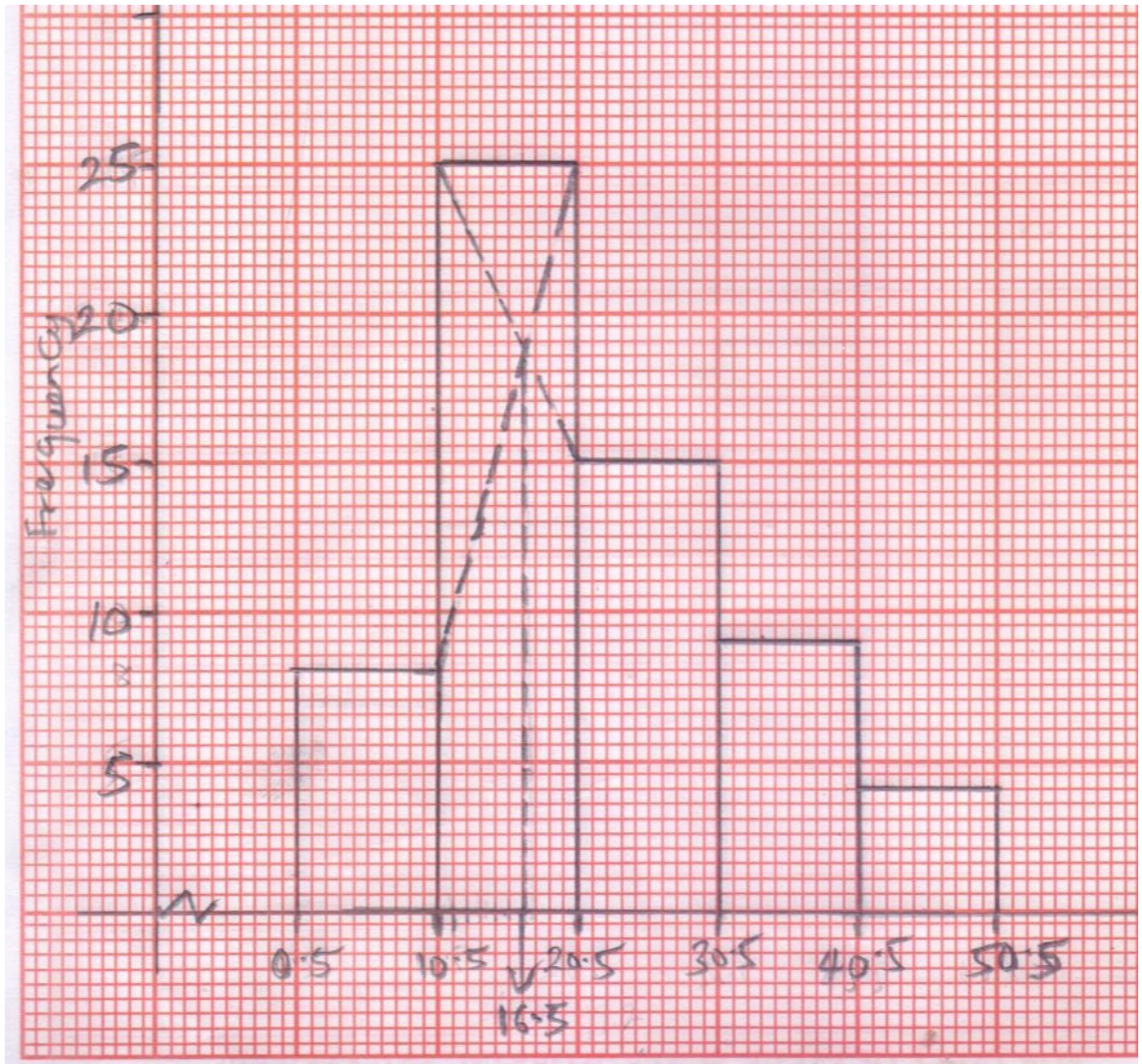
SECTION A – PART 1

MULTIPLE-CHOICE SOLUTIONS

1. C
2. B
3. B
4. D
5. B
6. C
7. D
8. B
9. A
10. C
11. C
12. D
13. C
14. A
15. C
16. D
17. E
18. B
19. E
20. C
21. E
22. D
23. A
24. C
25. D
26. D
27. E

28.	A

29.	D

30.	C

Workings (MCQ)

1.

The Mode estimated from the histogram is 16.5

5.

Commodity Item	2020		2021	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1
Milo	2.0	3	2.5	5
Sugar	2.5	4	3.0	6
Malt	3.0	2	2.5	3

Item	p_0	q_0	p_1	q_1	$p_0 q_0$	$p_1 q_0$
Milo	2.0	3	2.5	5	6.0	7.5
Sugar	2.5	4	3.0	6	10.0	12.0
Malt	3.0	2	2.5	3	6.0	5.0
TOTAL					22.0	24.5

$$\text{La} - p_{01} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$\text{LaspeyreIndex}_{(2020)} = \frac{24.5}{22.0} \times 100$$

$$= 111.36\%$$

8. Putting the data in an array, i.e., 3, 4, 6, 7, 8, 9, 10, 12, 13, 15
8 and 9 are the two middle numbers.

Median is the mean of the two middle numbers.

Median is the mean of the two middle numbers = (8+9)/2 = 8.5

9. Coefficient of Variation (C.V.) $= \frac{\text{Standard deviation}}{\text{Mean}} \times 100\%$.

$$\text{Mean}(\bar{x}) = \frac{54 + 55 + 48 + 39 + 46 + 56 + 39 + 51 + 44}{9}$$

$$= \frac{432}{9}$$

$$= 48$$

Standard deviation, $S = \sqrt{\frac{\sum x_i^2 - n(\bar{x})^2}{n}}$,
where

$$\sum x_i^2 = 54^2 + 55^2 + 48^2 + 39^2 + 46^2 + 56^2 + 39^2 + 51^2 + 44^2 = 21,076$$

$$\therefore S = \sqrt{\frac{21076 - 9(48)^2}{9}}$$

$$= \sqrt{\frac{21076 - 20736}{9}}$$

$$= \sqrt{\frac{340}{9}}$$

$$= \sqrt{37.78}$$

$$= 6.15$$

Thus,

$$\text{C.V.} = \frac{S}{\bar{x}} \times 100$$

$$= \frac{6.15}{48} \times 100$$

$$= 12.81\%$$

11. Let P(X) be the probability that X is selected; thus P(X) = 1/5

P(Y) be the probability that Y is selected; thus P(Y) = 2/5

P(X') is the probability that X is not selected; therefore

P(X') = 1 – P(X) = 1 – 1/5 = 4/5

P(Y') is the probability that Y is not selected, hence

P(Y') = 1 – P(Y) = 1 – 2/5 = 3/5

For the event that only one of them will be selected, there are two possibilities: (i) X is selected and Y is not selected; (ii) X is not selected and Y is selected.

P(X is selected and Y is not selected) = P(X) x P(Y')

$\qquad$ = 1/5 x 3/5 = 3/25

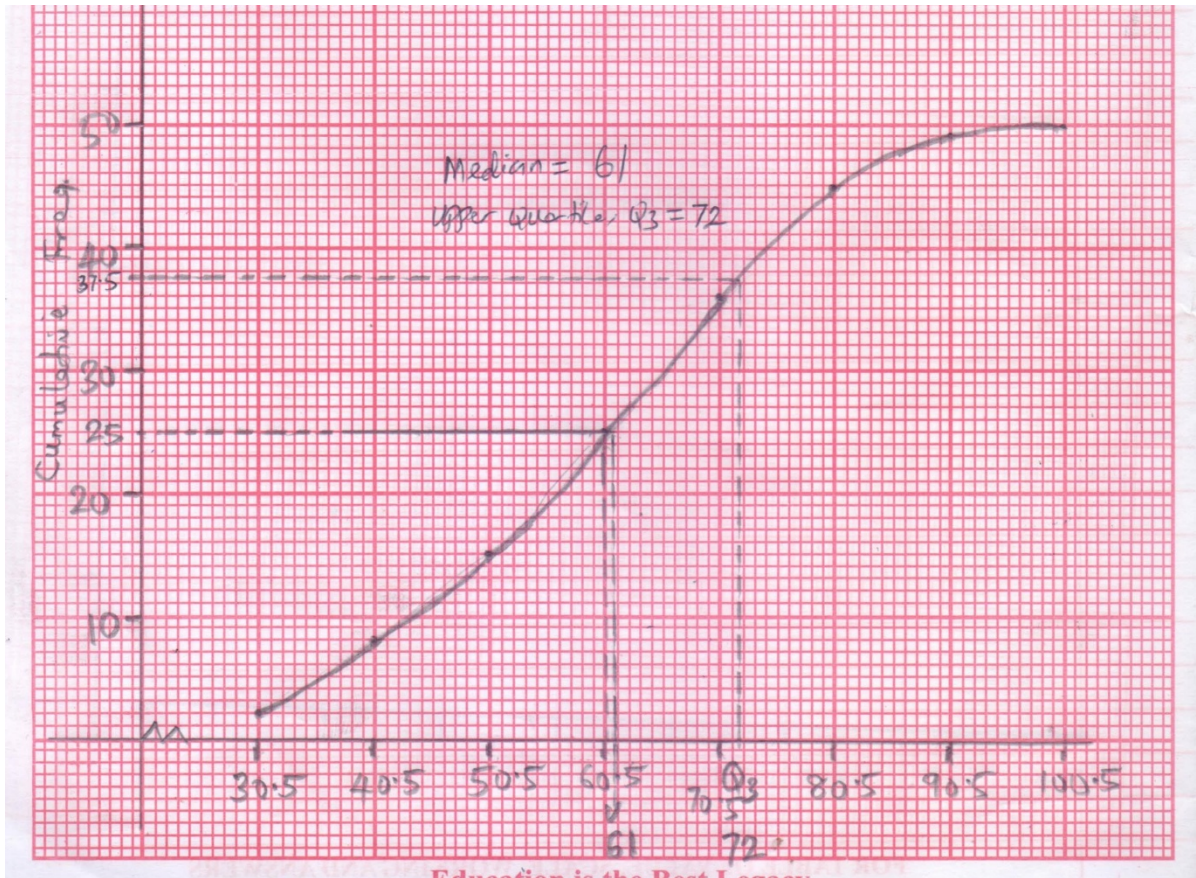P(X is not selected and Y is selected) = P(X') x P(Y)

$\qquad$ = 4/5 x 2/5

$\qquad$ = 8/25

Therefore, the probability that only one of them is selected is the sum of the 2 probabilities already obtained, that is 3/25 + 8/25 = 11/25

12.

Given N=50,
Recall that, median is the mark corresponding to one-half of the total cumulative frequency, i.e., the mark corresponding to a cumulative frequency of 25 ($\frac{1}{2}$ X N = $\frac{1}{2}$ x 50 = 25).

From the graph, the median = 61 (That is 25 on the cumulative frequency-axis corresponds to 61 on the score-axis on the graph)

Upper quartile, Q_3 is the mark corresponding to 75% of total cumulative frequency, i.e. the mark corresponding to a cumulative frequency of 37.5 (i.e., 3/4 of N = $\frac{3}{4}$ x 50 = 37.5).

From the graph, Q_3 = 72 (37.5 on the cumulative frequency-axis corresponds to 72 on the score-axis on the graph)

13. Obtain the value of the objective function for each of the corner points given.

Coordinates	Value of $4x + 10y$
(48, 84)	$4(48) + 10(84) = 1032$
(0, 120)	$4(0) + 10(120) = 1200$
(0, 0)	$4(0) + 10(0) = 0$
(90, 0)	$4(90) + 10(0) = 360$

The corner point with the coordinates of (0, 120) gives the highest value of the objective function (i.e. 1,200). Hence, 1200 is the maximum possible profit for the objective function.

15.

Month	1	2	3	4
Percentage of failures	25	30	35	10

From the given information, we have

Month (X_i)	Percentage failure	Probabilities (P_i)
1	25	0.25
2	30	0.30
3	35	0.35
4	10	0.10

Given N = 1000.

Let N_1 represents the number of transistors failing at the end of the ith month and N_0 = 1000.

Thus, we have the following replacements in the subsequent months:

$N_0 = N_0 = 1000$ (initial)

At the end of the first month, $N_1 = N_0P_1 = 1000 \times 0.25 = 250$

At the end of the second month,

$N_2 = N_0P_2 + N_1P_1 = 1000 \times 0.30 + 250 \times 0.25 = 362.5 \approx 363.$

At the end of the third month,

$N_3 = N_0P_3 + N_1P_2 + N_2P_1 = 1000 \times 0.35 + 250 \times 0.30 + 363 \times 0.25 \approx 516.$

Therefore, the number of transistors failing at the end of the third month is 516.

17. Since the demand and supply are equal, the NWCR algorithm applied to this problem gives the following table:

Source	T$_1$		T$_2$		T$_3$		T$_4$		Supply
S$_1$	(16)	5	(3)	3		6		2	~~19~~ ~~3~~ 0
S$_2$		4	(15)	7	(22)	9		1	~~37~~ ~~22~~ 0
S$_3$		3		4	(9)	7	(25)	5	~~34~~ ~~25~~ 0
Demand	~~16~~ 0		~~18~~ ~~15~~ 0		~~31~~ ~~9~~ 0		~~25~~ 0		90

Total Cost = (16 ×5) + (3 ×3) + (15 ×7) + (22 ×9) + (9 ×7)+(25 ×5)= 580
Thus, the minimum total cost is ₦580,000.

Remark: In transportation table, figures in rectangular boxes are the transportation costs from origins to destinations while the circled figures represent the allocation.

Explanation on the above allocation

Beginning from North-West (i.e., Cell S$_1$T$_1$) corner:

(i) Allocate 16 to cell S$_1$T$_1$in order to satisfy the minimum of demand and supply capacities. Zero balance is left demand while that of supply along S$_1$T$_1$ is 3. Therefore, column 1 is crossed out;

(ii) Move to cell S$_1$T$_2$ and allocate 3. The supply balance is zero while the demand balance is 15. Therefore, row 1 is crossed out;

(iii) Next, move to cell S$_2$T$_3$ to allocate 22 giving the balance of zero for supply and 9 for demand along that cell. Row 2 is thus crossed out;

(iv) Move to cell S$_3$T$_3$ and allocate 9 giving the balance of zero for demand while that of supply is 23. Therefore, column 3 is crossed out;

(v) Finally, 25 is allocated to cell S$_3$T$_4$.

19. For the given problem,
Total supply = 150 + 175 + 275 = 600
Total demand = 200 + 100 + 350 = 650.

This problem is unbalanced because total supply is not equal to total demand. As in this case, since the demand is more than the supply so a dummy row will be added and a supply of (total demand − total supply) at zero cost will be given to that row.

In the given table, the given total supply is 600 while the total demand is 650. Therefore, a dummy row is created for the difference of 50 (as supply) with zero costs.

Creating a dummy factory, we have

Factories	Warehouses			Factory capacities
	A	B	C	
X	6	8	10	150
Y	7	11	11	175
Z	4	5	12	275
Dummy	0	0	0	50
Warehouse Requirements	200	100	350	650

The steps in VAM are:

Step 1: Compute for each row (column) the penalty by subtracting the smallest unit from the next smallest unit cost in the same row (column);
For example, in the first row, 6 and 8 are the smallest and next smallest values, their absolute difference is 2.

Step 2: Select the row or column with the highest penalty and then allocate as much as possible to the variable with the least cost in the selected row or column. Any ties should be handled arbitrarily;

Here, the highest penalty is 10 and the least cost in the corresponding column is 3.
For this cell, min(supply, demand) = min(50, 350) = 50
Allocate 50 in that cell, that is cell (4, 3).

Applying these steps of VAM, gives the following table:

Source (Factories)	Destination (Warehouses)			Factory capacities (Supply)	Row penalty
	A	B	C		
X	6	8	10	159	2
Y	7	11	11	175	4
Z	4	5	12	275	1
Dummy	0	0	0 50	~~50~~ 0	0-
Warehouse Requirements (Demand)	200	100	350 300	650	
Column penalty	4	5	10		

81

27.
$$p = 100q - 2q^2$$
$$\frac{dp}{dq} = 100 - 4q$$

Elasticity of demand, $e_d = \frac{p}{q}\left(\frac{dq}{dp}\right)$

$$e_d = \frac{100q - 2q^2}{q} \times \frac{1}{100 - 4q}$$
$$= \frac{100 - 2q}{100 - 4q}$$
$$= \frac{50 - q}{50 - 2q}$$

When $q = 20$,

$$e_d = \frac{50 - 20}{50 - 2(20)} = \frac{30}{10}$$

That is, $e_d = 3.0$

28. Let i be the discount rate.
The NPV of the investment is

$$NPV = -70{,}000{,}000 + \frac{95{,}000{,}000}{(1 + i)^4}$$

Since internal rate of return is the discount rate at which the Net Present Value (NPV) is zero, we have

$$-70{,}000{,}000 + \frac{95{,}000{,}000}{(1 + i)^4} = 0$$
$$\frac{95{,}000{,}000}{(1 + i)^4} = 70{,}000{,}000$$
$$(1 + i)^4 = \frac{95{,}000{,}000}{70{,}000{,}000}$$
$$(1 + i)^4 = 1.3571$$
$$1 + i = \sqrt[4]{1.3571}$$
$$1 + i = 1.0793.$$

Hence,
$$i = 0.0793$$
The discount rate at which the NPV is zero is about 7.93%.

29. Cost price = N110,000, Discount % = 12%, Profit% = 10%

$$\text{Selling price, SP} = \frac{\text{CP} \times (100 + \textbf{Profit \%})}{100}$$

$$= \frac{110,000 \times (100 + 10)}{100}$$

$$= \frac{110,000 \times 110}{100} = \textbf{N121,000}$$

Selling price (SP) = Marked price (MP) - Discount

Selling price (SP) = Marked price (MP) − 12% of MP = MP − 0.12MP = 0.88MP

$$\Rightarrow \quad SP = 0.88MP$$

$$\Rightarrow \quad \text{MP} = \frac{\text{SP}}{0.88} = \frac{121,000}{0.88} = 137,500 = \text{₦137,500}$$

30. The given Venn diagram is
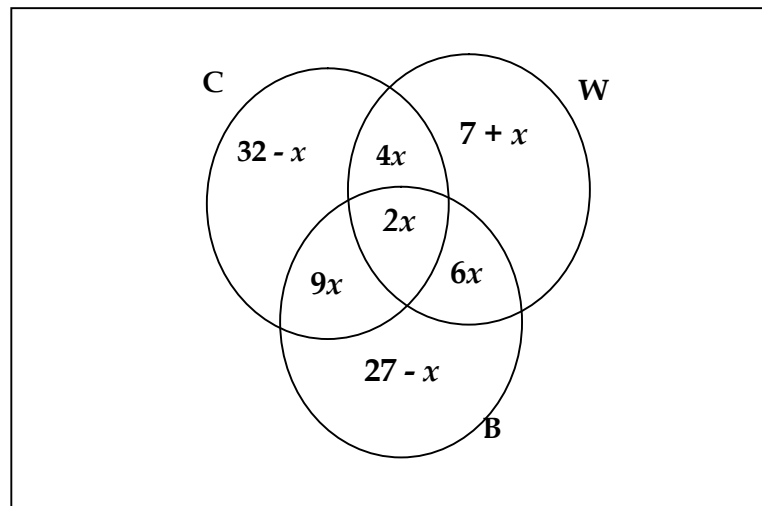
Total number of consumers $= (32 - x) + 4x + (7 + x) + 2x + 9x + 6x + (27 - x) = 166$

That is, $66 + 20x = 166 \Rightarrow 20x = 100$

Solving this equation yields $x = 5$.

Thus, the number of consumers who purchased all the three beverage drinks is $2x = 2 \times 5 = 10$.

Examiner's comment

The Multi-Choice Questions (MCQ) test the candidates' knowledge of the Quantitative Analysis as it relates to a typical accountant. The questions also tests their versatility in the subject.

On the average, about 80% of the candidates assessed in this area got 15 marks out of the total of 30 marks. The MCQs 1 to 30 covered the entire QA syllabus and the questions are of good standard.

SECTION A – PART II

SHORT-ANSWER SOLUTIONS

1. rectangles, frequency polygon; (in that order)

2. 31.4 years

3. 85.71%

4. If the population size is less than 30, that is, when $N < 30$

5. 40

6. 12

7. semi-averages

8. 121.72%

9. $A' \cap B' = \{\ \}$ $or\ \emptyset$ or empty set or $null\ set$

10. ₦8,380.

11. 2,000

12. 13

13. source; one (1); (in that order)

14. 6

15. ₦730,000

16. fixed/regular, irregular (in that order)

17. feasible region

18. unbalanced

19. known, constant (in that order)

20. H: 00 – 66, L: 67 – 99   **or**
     L: 00 – 32, H: 33-99

Workings (SAQ)

2. The calculation of the mean is provided in the table:

Class Interval	f	x	fx
10 – 20	10	15	150
20 – 30	20	25	500
30 – 40	6	35	210
40 – 50	8	45	360
50 – 60	4	55	220
60 – 70	2	65	130
	$\sum f = 50$		$\sum fx = 1570$

Then, we know that, mean of grouped data is given by

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{1570}{50} = 31.4$$

Hence, the mean age of the people is 31.4 years.

3. Coefficient of variation $= \frac{\text{Standard deviation}}{\text{Mean}} \times 100$.

Given:

Arithmetic mean = 7;

Variance = 36

It is known that standard deviation, SD $= \sqrt{\text{Variance}}$

Thus, SD $= \sqrt{36} = 6$

Therefore, Coefficient of variation $= \frac{6}{7} \times 100 = 85.7\%$

4. When the sample size is less than 30 i.e $n < 30$

5. We first rank the marks as shown in this table:

x	y	Rank of x (R_x)	Rank of y (R_y)	$d = R_x - R_y$	d^2
70	50	1	5	-4	16
65	52	2	4	-2	4
63	56	3	3	0	0
62	59	4	2	2	4
55	61	5	1	4	16
					$\sum d^2 = 40$

6.

	1	2	3	4	5	6
H	(H, 1)	(H, 2)	(H, 3)	(H, 4)	(H, 5)	(H, 6)
T	(T, 1)	(T, 2)	(T, 3)	(T, 4)	(T, 5)	(T, 6)

$$n(S) = 12$$

8.

$$\text{Marshall Edgeworth's Index} = \frac{\sum p_1 q_0 + \sum p_1 q_1}{\sum p_0 q_0 + \sum p_0 q_1} \times \frac{100}{1}$$

$$\text{Marshall Edgeworth's Index} = \frac{\sum p_1 q_0 + \sum p_1 q_1}{\sum p_0 q_0 + \sum p_0 q_1} \times \frac{100}{1}$$

$$= \frac{157 + 168}{134 + 133} \times \frac{100}{1}$$

$$= \frac{325}{267} \times \frac{100}{1}$$

$$= 121.72\%$$

9. Given

$U = \{5, 10, 20, 50, 100, 200, 500, 1000\}$,

A = {5, 20, 100, 500} and B = {10, 50, 200, 1000}.

The complement of set A is the set of elements that are members of the universal set U but not members of set A.

Then A′ = {10, 50, 200, 1000} and B′ = {5, 20, 100, 500}.

The intersection of sets for two given sets is the set that contains all the elements that are common to both sets.

Therefore, the intersection of the compliments of A and B is:

$$A' \cap B' = \{\ \ \} \ or \ \emptyset \ \text{ empty set or null set}$$

10.
$$TC = \int_0^{10} (3q^2 + 2q - 1)dq$$

$$= \left[q^3 + q^2 - q \right]_0^{20}$$

$$= 20^3 + 20^2 - 20$$

$$= 8,380$$

Thus, the total cost (in Naira) of producing 20 units of items is ₦8,380

11. Let x represent the number of items produced and sold.

Then the total cost function is

$$C(x) = 2,400,000 + 750x.$$

The revenue function is

$$R(x) = \text{price} \times \text{quantity of items produced and sold}$$

$$= \text{Price} \times x$$

$$= 1,950x$$

For the break-even situation, $R(x) = C(x)$.

Thus, we have

$$1,950x = 2,400,000 + 750x$$

$$\Rightarrow 1,200x = 2,400,000$$

$$\therefore x = 2,000$$

The quantity of items to be produced and sold at breakeven point 2,000.

12. Let $u = 4x + 3,\ then\ \dfrac{dU}{dx} = 4;$

$v = 3x - 5,\ then\ \dfrac{dV}{dx} = 3\ and$

$y = (3x + 5)(4x + 3)$

By product rule, we have

$$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$$

$\dfrac{dy}{dx} = (4x + 3)\,(3) + (3x - 5)(4) = 12x + 9 + 12x - 20$

$= 24x - 11.$

When $x = 1,\ \dfrac{dy}{dx} = 13$

Aliter

$y = 12x^2 + 9x - 20x - 15$

$\therefore 12x^2 - 11x - 15 \Rightarrow \dfrac{dy}{dx} = 24x - 11$

$\therefore$ when $x = 1,\ \dfrac{dy}{dx} = 13$

14. The simulation problems using random numbers are given below

Assign sets of two-digit random numbers to demand levels as shown in the table.

Demand	Probability	Cumulative Probability	Random Number Intervals
4	0.05	0.05	00 – 04
5	0.25	0.30	05 – 29
6	0.30	0.60	30 – 59
7	0.25	0.85	60 – 84
8	0.15	1.00	85 – 99

Entries in Column 4 are obtained by multiplying entries in column 3 by 100 and less by 1.

The demand forecast for ten days are as shown in the table below:

Trial No.	Random Number	Simulated Demand/per day
1	68	7
2	47	6
3	92	8
4	76	7
5	86	8
6	46	6
7	16	5
8	28	5
9	35	6
10	54	6

Thus, the demand forecast for the sixth day is 6.

15 Let us first check a necessary condition for solving the problem. That is, the total supply should be equal to the total needs of consumers.

The total supply of suppliers: 60 + 50 + 70 = 180 units.

The total needs of consumers: 70 + 80 + 30 = 180 units.

The total supply equals the total needs of consumers. This shows that the transportation problem is balanced. Thus, the Least Cost Method (LCM) can be applied as follows:

Step 1: Assign as much as possible to the smallest unit cost (ties are broken arbitrarily). Also bear in mind the idea of allowable minimum of supply and demand capacities as done in NWCR;

Step 2: Cross-out the exhausted row or column and adjust the supply and demand accordingly. If both row and column are exhausted simultaneously, only one is crossed-out (in order to avoid degenerating case); and

Step 3: Look for the smallest cost in the uncrossed row or column and assign the allowable quantity. Repeat this process until left with exactly one uncrossed row or column.

Using the steps highlighted above gives the following table:

Supplier	Consumer			Supply
	X	Y	Z	
A	5 ⟨30⟩	6 ⟨30⟩	4	~~60~~ ~~30~~ 0
B	8	3 ⟨50⟩	9	~~50~~ 0
C	4 ⟨40⟩	8	3 ⟨30⟩	~~70~~ ~~40~~ 0
Customer Needs/ Demand	~~70~~ ~~30~~ 0	~~80~~ ~~30~~ 0	~~30~~ 0	

The minimum transportation cost is calculated thus:

$(30 \times 5) + (30 \times 6) + (50 \times 3) + (40 \times 4) + (30 \times 3) = 730$

Hence, the minimum transportation cost is ₦730,000.

20.

Type	Probability	Cumulative Probability	Random Numbers
Low Sales (L)	0.33	0.33	00 – 32
High Sales (H)	0.67	1.00	33 – 99

The random number ranges to represent H and L are, respectively 33 - 99 and 00 – 32 respectively.

Examiner's comment

The Short-Answer Questions assessed the candidates on how to recall the basic principles of the QA. About 74% of the candidates that attempted the Questions got 10 marks and above out of the maximum of 20 marks.

The Short-Answer questions 1 to 20 covered the entire syllabus and all the 10 questions are of good standard.

SECTION B

SOLUTION 1

Commodity	2020		2021	
/ Item	Price	Quantity	Price	Quantity
	p_0	q_0	p_i	q_i
A	300	18	400	15
B	500	6	500	9
C	400	20	600	26
D	100	14	300	15
E	800	5	100	4
	$\sum p_{2020} = 2,100$		$\sum p_{2021} = 1,900$	

a. Using year 2020 as the base year:

Simple Aggregative Price Index, $SAPI = \dfrac{\sum p_{2021}}{\sum p_{2020}} \times \dfrac{100}{1}$

$$= \frac{1900}{2100} \times \frac{100}{1} \%$$

$$= 90.48\%$$

b. Paasche Index is given by:

$$I_{\mathrm{P}} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times \frac{100}{1}$$

where $\sum$ stands for summation;

$q_0 =$ quantity of the base year;

$p_0 =$ price of the base year;

$p_1 =$ price of the current or given year; and

$q_1 =$ quantity of the current or given year

Using year 2020 as the base year and year 2021 as the current year,

Item	p_0	q_0	p_1	q_1	$p_0 q_0$	$p_0\,q_1$	$p_1\,q_0$	$p_1\,q_1$
A	300	18	400	15	5400	4500	7200	6000
B	500	6	500	9	3000	4500	3000	4500
C	400	20	600	26	8000	10400	12000	15600
D	100	14	300	15	1400	1500	4200	4500
E	800	5	100	4	4000	3200	500	400
Total	2100		1900		21800	24100	26900	31000

$$\sum p_0 q_0 = 21,800 \,;\; \sum p_0 q_1 = 24,100 \,;\; \sum p_1 q_0 = 26,900 \,;\; \sum p_1 q_1 = 31,000$$

Using year 2020 as the base year:

Paasche Index, $I_P = \dfrac{\sum p_1 q_1}{\sum p_0 q_1} \times \dfrac{100}{1}$

$= \dfrac{31,000}{24,100} \times \dfrac{100}{1}$

$= 128.63\%$

c. Fisher Index, $I_F = \sqrt{\dfrac{\sum p_i q_0}{\sum p_0 q_0} \times \dfrac{\sum p_i q_i}{\sum p_0 q_i}} \times \dfrac{100}{1}\,\%$

$I_F = \sqrt{\dfrac{26,900}{21,800} \times \dfrac{31,000}{24,100}} \times \dfrac{100}{1}\,\%$

$= 125.99\%$

Examiner's comment

This question tests the cnadidates' knowledge of Index Numbers such as Simple Aggregate Price Index, the Paasche Index and the Fisher's Ideal Index.

79% of the candidates attempted the question. About 95% of them got 10 marks and above out of the maximum obtainable marks of 12.5.

SOLUTION 2

Year	Year (x)	Sales (y)	xy	x^2
2012	1	70	70	1
2013	2	80	160	4
2014	3	96	288	9
2015	4	100	400	16
2016	5	95	475	25
2017	6	114	684	36
2018	7	120	840	49
2019	8	123	984	64
2020	9	140	1260	81
2021	10	153	1530	100
	$\sum x = 55$	$\sum y = 1{,}091$	$\sum xy = 6{,}691$	$\sum x^2 = 385$

(a) Let the regression line be $y = a + bx$

Where: $b = \dfrac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \dfrac{10(6691) - (55)(1091)}{10(385) - (55)^2}$

$$= \frac{66910 - 60.005}{3850 - 3025}$$

$$= \frac{6905}{825}$$

$$= 8.3697$$

$a = \bar{y} - b\bar{x}$

$$= \frac{1{,}091}{10} - 8.3697 \left(\frac{55}{10}\right)$$

$$= 109.1 - 46.0333$$

$$= 63.0667$$

Therefore, regression line is given by

$y = 63.0667 + 8.3697x$

(b)

x	Trend $(y) = 63.0667 + 8.3697x$
1	$y(1) = 63.0667 + 8.3697(1) = 71.4364$
2	$y(2) = 63.0667 + 8.3697(2) = 79.8061$
3	$y(3) = 63.0667 + 8.3697(3) = 88.1758$
4	$y(4_- = 63.0667 + 8.3697(4) = 96.5455$
5	$y(5) = 63.0667 + 8.3697(5) = 104.9152$
6	$y(6) = 63.0667 + 8.3697(6) = 113.2849$
7	$y(7) = 63.0667 + 8.3697(7) = 121.6546$
8	$y(8) = 63.0667 + 8.3697(8) = 130.0243$
9	$y(9) = 63.0667 + 8.3697(9) = 138.3940$
10	$y(10) = 63.0667 + 8.3697(10) = 146.7637$

(c)   For year 2022, x=11

$y = 63.0667 + 8.3697 (11)$

$\therefore y = 155.1334$

Thus, the sales volume for the year 2022 is

$$L\$(155.1334 \times 1,000,000) = L\$155,133,400$$

ALITER for 2a

Let $t = x_i - x_m, where$

x_m is the median of x values (i.e. column x)

i.e. $x_m = \dfrac{5+6}{2} = \dfrac{11}{2} = 5.5$

year	x	$t = x - 5.5$	y	ty	t^2
2012	1	-4.5	70	-315	20.25
2013	2	-3.5	80	-280	12.25
2014	3	-2.5	96	-240	6.25
2015	4	-1.5	100	-150	2.25
2016	5	-0.5	95	-47.5	0.25
2017	6	0.5	114	57	0.25
2018	7	1.5	120	180	2.25
2019	8	2.5	123	307.5	6.25
2020	9	3.5	140	490	12.25
2021	10	4.5	153	688.5	20.25
		$\sum t = 0$	$\sum y = 1091$	$\sum ty = 690.5$	$\sum t^2 = 82.5$

The linear trend is $y = a + bt,$

Where $t = x_i - 5.5$

$$b = \frac{\sum ty}{\sum t^2} = \frac{690.5}{82.5}$$

$\therefore b = 8.3697$

$a = \bar{y} - b\,\bar{t}$

$$= \frac{\sum y}{n} - b\frac{\sum t}{n}$$

$$= \frac{1,091}{10} - 0 \quad (\text{since } \sum t = 0)$$

$$= 109.1$$

Therefore, the regression line equation is given by
$$y = 109.1 + 8.3697\,t$$

ALITER for 2b

Year	$t = x - 5.5$	$Trend\ \hat{y} = 109.1 + 8.3697t$
2012	-4.5	$y(-4.5) = 109.1 + 8.3697(-4.5) = 71.4364$
2013	-3.5	$y(-3.5)) = 109.1 + 8.3697(-3.5) = 79.8061$
2014	-2.5	$y(-2.5) = 109.1 + 8.3697(-2.5) = 88.1758$
2015	-1.5	$y(-1.5)\_ = 109.1 + 8.3697(-1.5) = 96.5455$
2016	-0.5	$y(-0.5)) = 109.1 + 8.3697(-0.5) = 104.9152$
2017	0.5	$y(0.5) = 109.1 + 8.3697(0.5) = 113.2849$
2018	1.5	$y(1.5) = 109.1 + 8.3697(1.5) = 121.6546$
2019	2.5	$y(2.5) = 109.1 + 8.3697(2.5) = 130.0243$
2020	3.5	$y(3.5) = 109.1 + 8.3697(3.5) = 138.3940$
2021	4.5	$y(4.5) = 109.1 + 8.3697(4.5) = 146.7637$

Examiner's comment

The question tests candidates' knowledge of Time Series Analysis on how to fix a regression line using the method of least squares, calculate the trend for the regression line equation and to use the regression line for estimation/prediction, that is, find y given x. Most of the candidates answered the question perfectly well. 90% of them got 9 marks and above out of the maximum allocated marks of 12½.

SOLUTION 3

a.

Time Interval	Class Boundaries	Frequency (f)	Cumulative frequency (cf)	Less than class boundaries/Upper Limits
20 – 24	19.5 – 24.5	3	3	24.5
25 – 29	24.5 – 29.5	8	11	29.5
30 – 34	29.5 – 34.5	17	28	34.5
35 – 39	34.5 – 39.5	29	57	39.5
40 – 44	39.5 – 44.5	15	72	44.5
45 – 49	44.5 – 49.5	6	78	49.5
50 – 54	49.5 – 54. 5	2	80	54.5

b (i) The cumulative frequency curve is drawn using the data in the fourth and fifth columns of the table, see the graph.
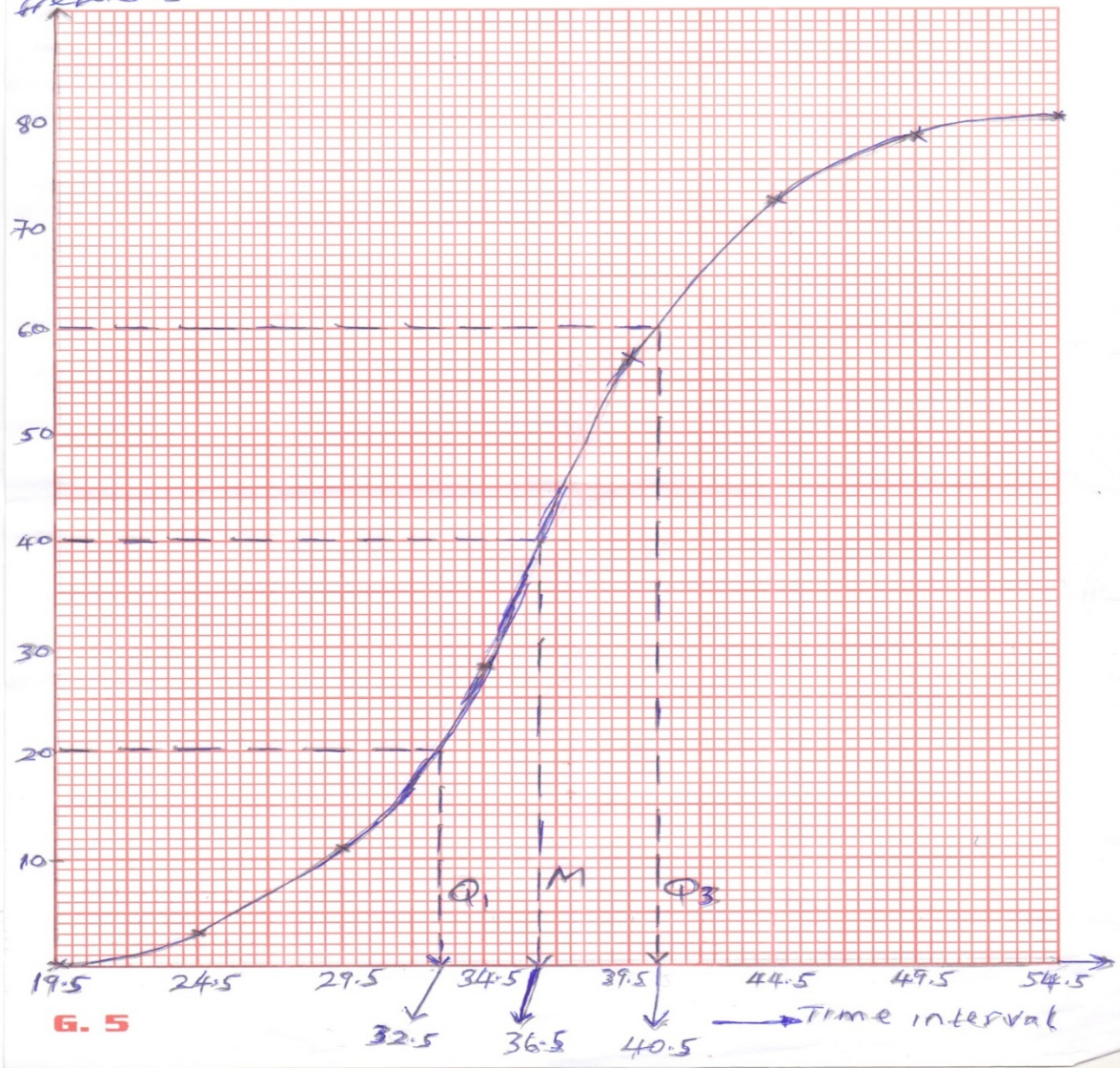
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No Of Question...... 3 ....   Candidate's No...

G. 5

(i)   The median score is the score corresponding to half of the total cumulative frequency, i.e., the score corresponding to a cumulative frequency of 40. From the graph, this is equal to 36.5.

(ii) Semi-interquartile range (SIR) is obtained from quartile range and it was defined by:

$$SIR = \frac{Q_3 - Q_1}{2}$$

Where Q_1 = First (lower) quartile, Q_3 = Third (upper) quartile and the numerator $Q_3 - Q_1$ is known as the interquartile range.

The lower quartile (Q_1) corresponds to the 25th percentile, i.e., a cumulative frequency = 25% of 80 = 20.

Thus, Q_1 = 32.5 (reading from the graph).

The upper quartile (Q_3) corresponds to the 75th percentile, i.e., a cumulative frequency = 75% of 80 = 60. From the graph, Q_3 reading is 40.5
Therefore, the semi-interquartile range is

$$SIR = \frac{Q_3 - Q_1}{2} = 4 = \frac{40.5 - 32.5}{2} = 4$$

(iii)   nth percentile is at $\dfrac{\sum f}{100} \times n$

$\therefore$ 75th percentile is at $\dfrac{\sum f}{100} \times 75 = \dfrac{80}{100} \times 75 = 60th\ position$

This is equivalent to the upper quartile obtained above. P_{75} reading from the cumulative frequency curve = 40.5

Examiner's comment

The question tests the candidates' knowledge of data allocation and diagrammatic presentation on how to construct a cumulate frequency curve (i.e ogive) and how to estimate the median, the quantiles and the percentiles from the constructed ogive. About 82.6% of the candidates attempted the question. About 95% of them got 11 marks and above out of the total of 12.5 marks allocated to the question.

SOLUTION 4

i. **Formulation of the LP problem:**

Let x represent the number of ballgowns produced and y the number of T-shirts produced.

Let P represent the total profit (contribution) generated. Then P is the objective functionto be maximized. Thus, the objective function takes the form:

Max. $P = 3{,}000x + 2{,}000y$ (₦3000 from a ball gown and ₦2000 from a T-shirt)

Subject to:

$$2x + y \leq 100 \text{ (Materials constraint)}$$

$$x + y \leq 80 \text{ (Labour hour constraint)}$$

$$x \leq 40 \text{ (demand constraint)}$$

$$x, y \geq 0 \text{ (non-negativity constraints)}$$

ii. **Solution of the LP:**

Writing and plotting the constraints as equations, proceed as follows:

Forline $l_1 : 2x + y = 100$, points are (0,100) and (50,0)
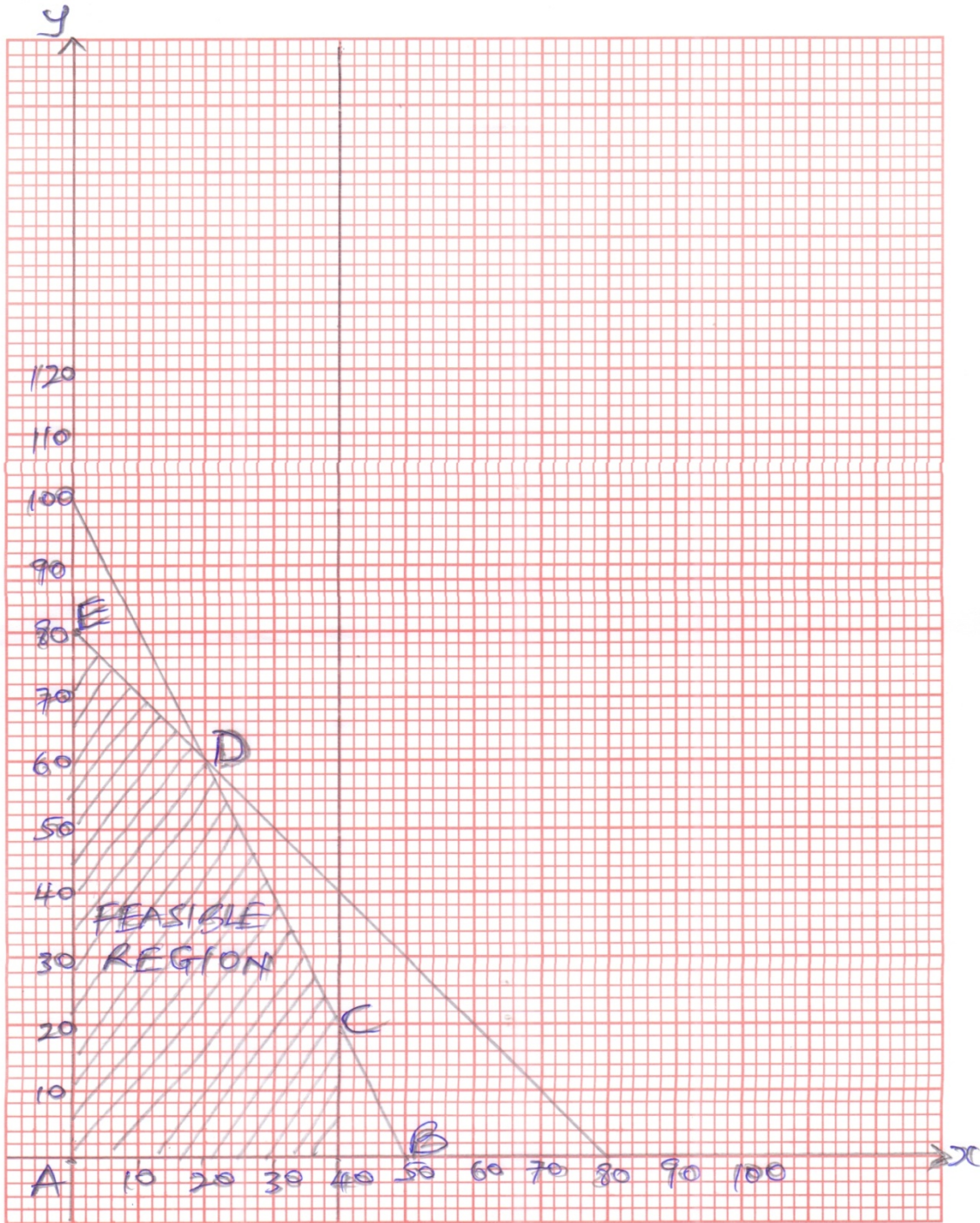
Forline $l_2 : x + y = 80$, points are (0,80) and (80,0)

Forline $l_3 : x = 40$.

The plot of the coordinates is shown on the graph.

G. 5

From the graph, the corner points of the boundary of the feasible region are A, B, C, D and E with the coordinates: A(0, 0), B(40, 0), C(40, 20), D(20, 60) and E(0, 80).

Coordinates	Value of the objective function ($3000x + 2000y$) (in Naira)	
(0, 0)	3000(0) + 2000(0)	= 0
B(40, 0)	3000(40) + 2000(0)	= 120,000
C(40, 20)	3000(40) + 2000(20)	= 160,000
D(20, 60)	3000(20) + 2000(60)	= 180,000
E(0, 80)	3000(0) + 2000(80)	= 160,000

Coordinates (20, 60) give the highest profit of ₦180,000. Hence, the optimal combination to be produced is 20 ballgowns and 60 T-shirts.

iii.   The binding constraints are

$2x + y \leq 100$ (Materials constraint)

$x + y \leq 80$ (Labour hours constraint)

Increasing the units of materials by 1 while the labour hours remain unchanged, we have

$$2x + y \leq 101$$

The constraints now become:

$2x + y \leq 101$ (materials constraint)

$x + y \leq 80$ (labour constraint)

The new constraints result into the following system of equations, which are to be solved simultaneously,

$$2x + y = 101$$

$$x + y = 80$$

Solving the resulting simultaneous equations yields new values of x and y as:

$$x = 21, y = 59.$$

Thus, the new contribution is obtained by substituting these values into the objective function as follows: 3,000(21) + 2,000(59) = 181,000

Recall the original contribution = ₦180,000

Difference = ₦181,000 − ₦180,000 = ₦1,000

i.e. 1 extra unit of material has resulted in an increase of ₦1,000 in the contribution.

Thus, the shadow cost per unit of materials is ₦1,000.

Examiner's comment

This question is on Operations Research part of revised QA syllabus. It tests candidates' knowledge of Linear Programming on how to: formulate a Linear Programming problem, determine the optimal solution using graphical method and to determine the shadow cost. About 59.8% of candidates attempted the question out of which about 95% of them got marks above the average.

SOLUTION 5

a.

i.   Economic Order Quantity (EOQ) is given by

$$ECQ = \sqrt{\frac{2C_0 D}{C_h}};$$

where

D = Annual required units;

C_0 = Ordering Cost

C_h = Inventory Unit Cost × Carrying cost as percentage of unit cost.

Given C_0 = 2,000; D = 73,500; C_h = (7.5% of 80) = 0.075 × 80 = 6

Thus, using these values in the formula gives

$$ECQ = \sqrt{\frac{2 \times 2,000 \times 73,500}{6}}$$

$$= \sqrt{49,000,000}$$

$$= 7,000 \, \text{units}$$

ii.

$$\text{Number of orders per year} = \frac{\text{Annual Demand}}{\text{EOQ}};$$

Thus, the number of orders per year $= \dfrac{73,500}{7,000} = 10.5$ or approximated to **11**.

∴ The number of orders per year is approximately **11**.

iii.   Ordering Cost = Fixed ordering cost × Number of orders per year.

Thus, Ordering Cost = 2,000 × 11 = ₦22,000.

iv.   It is given that Carrying cost = carrying cost as a percentage of unit cost $\times \dfrac{ECQ}{2}$.

Hence, the carrying cost $= 80 \times 0.075 \times \dfrac{7,000}{2} = N21,000$.

v.   Total Inventory cost = Ordering Cost + Carrying Cost.

That is, Total Inventory Cost = ₦22,000 + ₦21,000 = ₦43,000.

b.   Given: Normal usage = 2,500 units;

Minimum usage = 750 units;

Maximum usage = 2,050 units

Minimum lead time = 9 weeks;

Maximum lead time = 12 weeks

Economic Order Quantity (EOQ) = 45,000 units

The control levels are obtained as follows:

Re-order level (ROL) = Maximum usage × maximum lead time

= 2,050 x 12

= 24,600

Maximum level = ROL + EOQ − (Minimum usage × minimum lead time)

= 24,600 + 45,000 − (750 x 9)

= 62,850

Examiner's comment

This question is on Inventory Control. It requires the candidates to know how to calculate the Economic Order Quantity, number of Orders per year, Carrying Cost, Total Cost of Inventory and Control Levels such as re-order and maximum levels.

The question was perfectly done by those who attempted it. About 75% of the candidates that attempted it got 10 marks and above out of the total of 12½ marks.

SOLUTION 6

a. Generating random interval for arrival and service respectively, we have the following:

Table 1: For Inter-arrival

Minutes	Probability	Cumulative Probability	RandomNumber Interval
1	0.20	0.20	00 – 19
3	0.25	0.45	20 – 44
5	0.30	0.75	45 – 74
7	0.14	0.89	75 – 88
9	0.11	1.00	89 – 99

Table 2: Service

Minutes	Probability	Cumulative Probability	RandomNumber Interval
1	0.19	0.19	00 – 18
3	0.21	0.40	19 – 39
5	0.30	0.70	40 – 69
7	0.18	0.88	70 – 87
9	0.12	1.00	88 – 99

Table 3: The simulation worksheet

Random number (1)	Inter-arrival time (min)	Arrival time (a.m.)	Service starts (a.m)	Random number (2)	Service time (min)	Service ends (a.m)	Waiting time Attendant (min)	Customer (min)	Line length
32	3	11.03	11.03	63	5	11.08	3	-	-
37	3	11.06	11.08	26	3	11.11	-	2	1
60	5	11.11	11.11	02	1	11.12	-	-	-
70	5	11.16	11.16	99	9	11.25	4	-	-
78	7	11.23	11.25	08	1	11.26	-	2	1
61	5	11.28	11.28	84	7	11.35	2	-	-
63	5	11.33	11.35	48	5	11.40	-	2	1
53	5	11.38	11.40	25	3	11.43	-	2	1
33	3	11.41	11.43	93	9	11.52	-	2	1
47	5	11.46	11.52	68	7	11.57	-	6	1
Total	46				48		9	16	6

b.

i. Average queue length $= \dfrac{\text{Total line length}}{\text{Number of customers}}$

$= 6/10 = 0.6 \approx 1$ customer

ii. Average waiting time of customers before service

$= \dfrac{\text{Total waiting time of customers before service}}{\text{Number of customers}}$

$= 16/10 = 1.6$ minutes

iii. Average service idle time $= \dfrac{\text{Total waiting time of attendant before service}}{\text{Number of customers}}$

$= 9/10 = 0.9$ minute

iv. Average service time $= \dfrac{\text{Total service time}}{\text{Number of customers}}$

$= 48/10 = 4.8$ minutes

v. Time a customer spends in the system =

= Average service time + Average waiting time of customers before service

$= 4.8 + 16 = 6.4$ minutes

vi. Probability of the service idle time = Percentage of service idle time

$$= \frac{9}{9+48} \times \frac{100}{1} \%$$

$$= \frac{9}{57} \times \frac{100}{1} \%$$

$$= 15.79\%$$

Explanation:

At the start of simulation, the first random number 32 generates an inter-arrival time of 3 minutes for the first customer, as shown in the stimulation work sheet (Table 3). The inter-arrival time is determined from the cumulative probability values in Table 1. In a similar vein, the random number 63 appearing under the Random number (2) column generates a service time of 5 minutes for the first customer, written under the column that follows it. The service time is determined from the cumulative probability values in Table 2. The same procedure is followed for other customers.

Since service to customers starts by 11.00 am and the inter-arrival time for the first customer is 3 minutes; so the attendant starts to attend to the first customer at 11:03 am upon arrival. The service time for the first customer is 5 minutes; thus service ends for him/her ends by 11:08 am.

First row for the first customer:

The attendant waits for 3 minutes before the arrival of the first customer; hence, waiting time by the Attendant on the first customer's row is 3 minutes.
The first customer's waiting time is 0, represented by a 'dash', because service is offered to him as soon as he arrives; also the line length is 0 represented by a 'dash' since there is no other person waiting.

Second row for the second customer:

The second customer arrives by 11:06 am. As at that time, the attendant is still attending to the first customer, so the Attendant's waiting time is 0. The second

customer has to wait for 2 minutes before service. So, service starts time for him/her is 11.08 am. For this reason, we write 2 minutes under the column for customer's waiting time. It should also be noted that the line length here is 1 because the second customer is the only person on queue.

Third row for the third customer:

Service ends for the second customer at 11.11 am while the third customer arrives at the same time. Therefore, service starts immediately for customer 3 at 11.11 am. The service time for the third customer determined by the random number '02' is 1 minute. As a result, service for this customer ends by 11:12 am.

Since the next customer (Customer 4) arrives at 11.16 am, then attendant and customer's waiting time are both zero and line length is also zero since there is no one on the queue.

Fourth row for the fourth customer:

As earlier noted, service ends for the third customer at 11.12 am while the fourth customer arrives at 11.16 am. So, the time elapse between service ends time for the 3rd customer (11.12 am) and arrival time for the 4th customer (11.16 am) is 4 minutes. Thus, the waiting time for the attendant before service is recorded as 4 minutes.

Examiner's comment

This question tests candidates' knowledge of Simulation. It is on how to use monte carlo method to solve a simulation problem using random numbers with some known probability distribution to simulate. This was the least attempted question. About 23.8% of candidates attempted the question out of which aout 97% of them got 5 marks and below out of the maximum of 12.5 marks allocated to it.

It is strongly recommended that students who will be candidates for the ICAN examination should be encouraged to study the current syllabus together with all available INSIGHTS. They should be exposed to more worked examples on QA.

THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
SEPTEMBER 2022 EXAMINATIONS (PART II)

INFORMATION TECHNOLOGY

PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER

EXAMINATION INSTRUCTIONS

1.   All solutions should be in ink. Any solution in pencil will not be marked.

2.   Read all instructions on each part of the paper carefully before answering the questions.

3.   Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**

4.   Check your pockets, purse and mathematical sets, etc to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.

5.   Do not enter the hall with anything written on your docket.

6.   Insert your examination number in the space provided above.

TUESDAY, 27, SEPTEMBER, 2022

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

INFORMATION TECHNOLOGY

Time Allowed: 3 hours

SECTION A: PART I   **MULTIPLE-CHOICE QUESTIONS**   **(30 Marks)**

ATTEMPT ALL QUESTIONS IN THIS SECTION

Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements.

1.   Which of the following is used to maintain a temporary storage of data and programs during processing?

   A.   Random Access Memory
   B.   Magnetic Floppy Disk
   C.   Auxiliary Memory
   D.   Cord Memory
   E.   Winchester Disk

2.   Which of the following is **NOT** a type of microcomputer?

   A.   Laptop
   B.   Desktop
   C.   Personal computer
   D.   Workstation
   E.   Analog computer

3.   Which of the following is the major operation performed by the control unit of a computer?

   A.   Perform logical comparison
   B.   Receive the results of processing from processor
   C.   Interpret the instructions given to the computer
   D.   Perform multiplication and division
   E.   Perform addition and subtraction

4. Which of the following is **NOT** an output device?

   A. Printer
   B. Plotter
   C. Flat screen
   D. Touch screen
   E. Microfilm

5. Which of the following is **NOT** a short-coming of Display equipment?

   A. User must be physically present to see what is displayed
   B. Output cannot be done with pen or pencil
   C. Output cannot be removed from the screen
   D. Output to be handled is limited to the size of the screen
   E. It encourages paper wastage

6. The combination of 4 bits of memory is referred to as

   A. Byte
   B. Nibble
   C. Word
   D. Double word
   E. Kilobyte

7. The following operations are designed for special purpose digital computer **EXCEPT**

   A. Applications for solving problems
   B. Air Traffic control
   C. Video Games
   D. Metrological station for weather forecasting
   E. Robots for process control in industry

8. The time-lag between when an operator enters data completely into the computer and the time the result of processing is released to the operator is called

   A. Response time
   B. Real time
   C. Log time
   D. Time-slicing
   E. Feedback time

9. A computer used to request access from a centrally located computer in a network is called

   A. Host
   B. File server
   C. Client
   D. Integrated computer
   E. Router

10. The modification of an operational system in order to generate additional reports is an example of

    A. System documentation
    B. System conversion
    C. System design
    D. System maintenance
    E. System implementation

11. File Transfer Protocol is a network protocol responsible for which of the following?

    A. Retrieve e-mail from a remote server
    B. Communicate data across a packet-switched internet
    C. Transmit e-mail across other internet protocol
    D. Exchange and manipulate files over a computer network
    E. Collect information from remote computer to the internet

12. Repetitive stress injury problem normally associated with computer usage does **NOT** include which of the following?

    A. Hepatitis
    B. Tendonitis
    C. Tennis elbow
    D. Inability to hold objects
    E. Sharp pains in fingers

13. Which of the following is **NOT** involved in Forensics?

    A. Data extraction
    B. Data recovery
    C. Data gathering of computer system and peripherals
    D. Investigation of computer personnel
    E. Investigation of computer used for cybercrime

14. The measure of the power signals during data transmission through a channel is called

   A. Baud
   B. Hertz
   C. Attenuation
   D. Multiplexing
   E. Coupling

15. The system program for converting source programs written in high-level language to machine code statement by statement is called

   A. Interpreter
   B. Compiler
   C. Assembler
   D. Loader
   E. Editor

16. Which of the following is **NOT** a procedural/application control?

   A. Control over input
   B. File control
   C. Control over output
   D. Control over file maintenance
   E. Control over processing

17. Bypassing all security systems by means of specialised software tools is known as

   A. Warez trading
   B. Cording
   C. Super zapping
   D. Data leakage
   E. Data dialing

18. Which of the following is **NOT** a means of external communication?

   A. Circular
   B. Telephone call
   C. Mail
   D. Telex
   E. Posters

19. Which of the following is the process of summarizing all operations carried out on data to enhance its understanding?

    A.   Capturing
    B.   Validating
    C.   Collating
    D.   Charting
    E.   Editing

20. In the investigation of a system, the major aspect or product is

    A.   Feasibility study
    B.   System Analysis
    C.   System design
    D.   Preliminary study
    E.   System control

21. System design deals with "how" while system Analysis deals with

    A.   Where
    B.   When
    C.   Who
    D.   What
    E.   Which

22. In cloud computing, which of the following service provides a frame work needed to create, test, deploy, manage and update software products?

    A.   Infrastructure-as-a-service
    B.   Platform-as-a-service
    C.   Human-wave-as-a-service
    D.   Function-as-a-service
    E.   Software-as-a-service

23. Information that incorporate human judgement and experience into a knowledge-base is called

    A.   Knowledge system
    B.   Real life system
    C.   Expert system
    D.   Intelligent system
    E.   Corporate system

24. Which of the following changeover methods during system implementation is the most risky?

    A.   Direct method
    B.   Phased method
    C.   Parallel method
    D.   Pilot method
    E.   One-on-One method

25. The technology that merges computing with high-speed communication links carrying data, sound and video is called

    A.   Computer technology
    B.   Communication technology
    C.   Technology convergence
    D.   Information technology
    E.   Digital convergence

26. Access to computer systems on personal basis has been influenced mainly by which of the following?

    A.   Increasing computer speed
    B.   Growing price reduction of computer devices
    C.   Connectivity of computer system to the internet
    D.   Portability of today's computer devices
    E.   Globalisation of information technology

27. Which of the following is **NOT** contained in a typical primary memory of a computer?

    A.   programs containing instructions for processing
    B.   Data read from input or secondary storage devices
    C.   Immediate results of processing
    D.   Output Information ready to be sent to output device
    E.   Data and instruction awaiting processing

28. Which of the following is **NOT** a type of Utility program?

    A.   Loader
    B.   Linker
    C.   Text editor
    D.   Assembler
    E.   Sorter

29. Computer security breaches usually lead to which of the following?

   A. Loss of integrity
   B. Loss of package license
   C. Loss of computing power
   D. Change of IT platform
   E. Loss of competence

30. Which of the following is designed to start operation when a certain event occurs on the computer?

   A. Worm
   B. Time bomb
   C. Logic bomb
   D. Trojan horse
   E. Trapdoor

SECTION A: PART II   SHORT-ANSWER QUESTIONS   (20 MARKS)

ATTEMPT ALL QUESTIONS

Write the correct answer that best completes each of the following questions/statements

1. The modification of a process or system with its results by measuring the differences between the desired and actual results is known as ....

2. A system in which the various states of activities follow each other in an organised pattern that can be predicted is called ....

3. The totality of all functions using information technology to process and communicate office information and transactions is known as ....

4. The act of copying computer software without the publisher's or developer's permission is called ....

5. A fully equipped computer centre with all resources needed to quickly resume operation in case of mishaps that could render continued operations impossible is called ....

6. A computer crime that involves transferring funds/money in small quantities from large accounts to the criminal's account is called ....

7. A search engine is an internet-based application for searching for information from any ....

8. The organ which sets out the terms of reference for a feasibility study team is ....

9. An office support system that electronically brings conference participants together without leaving their bases or locations is called ....

10. A computer-based directory containing information about items in a database is called ....

11. Output control ensures that .... are accurate, complete and properly distributed

12. The .... ensures that a packet of data arrives at a correct address after transfer through the internet

13. The data transmission of exact duplicate copies of a document including signature, picture and diagram is called ....

14. The process of identifying, detecting and correcting errors to improve the quality of data is called ....

15. A system that has the ability to change itself or environment in order to survive is called ....

16. A collection of computer programs for controlling the use of the hardware as well as acting as an interface with application program is called ....

17. Assembly language is said to be machine dependent whereas a procedure language is said to be ....

18. The diagrammatic or pictorial representation of the steps to be followed in writing a computer program is called ....

19. The process of combining multiple networked computers geographically distributed to work together for accomplishment of joint tasks is called..............

20. The transformation of existing data files into the form required by the new system during system implementation is called ....

SECTION B: **ATTEMPT ANY FOUR QUESTIONS** **(50 MARKS)**

QUESTION 1

a. What is direct data capture? (1 Mark)

b. Enumerate **FIVE** direct data capturing devices. (2$\frac{1}{2}$ Marks)

c. List **FIVE** features of Fourth Generation computers (5 Marks)

d. Enumerate **FOUR** factors to be considered in choosing a programming language for writing programs or solving problems (4 Marks)
(Total 12$\frac{1}{2}$ Marks)

QUESTION 2

a. i. What is a language translator? (1 Mark)
   ii. State the **THREE** major type of translators (1$\frac{1}{2}$ Marks)
   iii. State **ONE** distinction among the **THREE** major type of translators
   (3 Marks)

b. What is a Spreedsheet Package? (2 Marks)

c. Enumerate **FOUR** application areas of word processing package (2 Marks)

d. State **THREE** advantages of word processing package over other packages
(3 Marks)
(Total 12$\frac{1}{2}$ Marks)

QUESTION 3

a. Computers are powerful processing devices.

   You are required to state the distinction among the following data processing techniques:
   i. Online processing
   ii. Batch processing
   iii. Centralised processing
   iv. Decentralised processing
   v. Distributed processing (7$\frac{1}{2}$ Marks)

b. i. What is a Data Communication channel?   (2 Marks)
    ii. Enumerate **THREE** examples of physical and **THREE** examples of wireless
        Data communication channels/links   (3 Marks)

(Total 12½ Marks)

QUESTION 4

a. i.   What is Electronic Commerce?   (1 Mark)

    ii. List **FIVE** components of Electronic commerce   (2½ Marks)

    iii. Enumerate **FOUR** advantages and **THREE** disadvantages of Electronic
         commerce over traditional trading and selling   (7 Marks)

b. State one distinction between uploading and downloading with respect to
    networking or internet   (2 Marks)

(Total 12½ Marks)

QUESTION 5

a. i. What is facility management?   (1½ Mark)

    ii. State **THREE** reasons for using facility management in an organisations
        information system   (3 Marks)

b. An important technology in modern computing is Grid computing.

    You are required to:

    i.   Define Grid computing   (1 Mark)

    ii. State **FOUR** application areas of Grid computing   (2 Marks)

    iii. Enumerate **THREE** benefits and **TWO** lapses of Grid computing (5 Marks)

(Total 12½ Marks)

QUESTION 6

a. What is a Virtual Office?   (1½ Marks)

b. State **FOUR** likely objectives of system analysis phase/stage, during system
    development   (4 Marks)

c. State **TWO** distinctions between a Modem and a Multiplexer   (4 Marks)

d. Enumerate **THREE** advantages of Computer Output on Microfilm(COM)

                                                                           (3 Marks)

(Total 12½ Marks)

SECTION A - PART I

MULTIPLE- CHOICE SOLUTIONS

1. A
2. E
3. C
4. E
5. E
6. B
7. A
8. A
9. C
10. D
11. D
12. A
13. D
14. A
15. A
16. B
17. C
18. A
19. D
20. A
21. D
22. B
23. C
24. A
25. D
26. D
27. E

28. E

29. A

30. C

Examiners' comment

This part consists of thirty (30) multiple choice questions which cover the entire sections of the syllabus. The standard of the questions is very high and is within the competence of the candidates. The performance is expected to be very high.

SECTION A - PART II

SHORT-ANSWER SOLUTIONS

1. Feedback Control System

2. Deterministic /Mechanistic system

3. Office Automation system/Office Information System

4. Software piracy

5. Hot site

6. Salami Technique

7. Website

8. Steering committee

9. Teleconference

10. Data dictionary/Data store

11. Information/ Results of processing

12. Internet protocol

13. Fax/facsimile

14. Data cleansing/Data normalization

15. Adaptive / cybernetic system

16. Operating system

17. Problem oriented/machine independent

18. Program Flowchart

19. Grid Computing

20. File conversion

Examiners' comment

This section consists of twenty (20) short answer questions. The questions cover over 70% of the syllabus and the quality is very high. As usual, we expect average performance in this section.

SECTION B

SOLUTION 1

1a. Direct Data capture refers to the use of devices that can interface with computer system without intermediary device to enter data into the computer for processing, that is, they accept data in machine readable form.

1b. Direct data capture devices include;

    i.   Optical Mark Reader (OMR).
    ii.   Magnetic Ink Character Reader (MICR).
    iii.   Optical Character Reader (OCR).
    iv.   Magnetic Strips Reader.
    v.   Plastic Cards.
    vi.   Smart Cards.

1c. Features of fourth generation computers include;

    i.   Use of very large scale integration technology (VLSI).
    ii.   They are cheaper to obtain than earlier generations of computers.
    iii.   They are portable and reliable.
    iv.   Reduction in energy consumption and power requirements.
    v.   There is reduced heat generation.
    vi.   Introduction of input-output devices.
    vii.   Introduction of interactive programming.
    viii.   Increased computational speed measured in Pico-seconds.
    ix.   Use of pipeline processing for data processing.
    x.   5.25 inch floppy disk introduced.
    xi.   Word processing, spreadsheet and office automation software introduced.
    xii.   There was mass production of micro components.
    xiii.   Concept of internet was introduced.
    xiv.   DBMS introduced.

1d. **Factors to be considered include;**

    i.   Development cost.

    ii.   Availability of language translator.

    iii.   Proficiency of the object programmer.

    iv.   Degree of portability or compatibility of the program.

    v.   Time to be taken in writing the program.

    vi.   Readability of the language.

    vii.   Machine efficiency of the language for each acceptance by the computers

    viii.   Maintainability.

    ix.   Modularity.

    x.   Security.

Examiners' comment

This question tests candidates' knowledge on Direct input devices, generation of computers (hardware only) and choice of programming language for processing activity. Majority of the candidates attempted this question and the performance is very good.

SOLUTION 2

2a. (i)   Language translator is a system program used for conversion of source program written in one programming language to another program (object) in machine language.

    (ii)   The three major type of language translator are:
        1.   Assembler
        2.   Compiler
        3.   Interpreter

    (iii) **Assembler:**

        This is a system program that translates programs written in assembly or low level language into machine code/language.

        Compiler:

        This is a system program that translates the whole source program written in high-level into machine code or language at once. It accepts the whole source program as input and produces the object program, that is, the

compiled version of the source program as output before executing the program. C and C^{++} are examples of compiler based languages.

Interpreter:

Interpreter translates source program written in high-level into machine code statement by statement. It translates a statement and executes it before taking on the next sentence. It is designed to translate one line of instruction at a time and immediately execute the line. Interpreter displays an error at a time.
Python, Ruby, PHP and Perl are examples of interpreter-based languages.

2b. Spreadsheet package:

Spreadsheet package is an electronic spreadsheet in-form of ledger with grid of rows and columns for the entry of data and for financial calculations. It is designed with functions and formulas that can prevent the user from entering the same data repeatedly, eliminating or reducing the rate of error. Examples include: Microsoft Excel, Lotus 1-2-3, Multiplan, Sideways, and Symphony.

2c. Application areas of word processing include:

1. Text editing and manipulation.
2. Production of mailing list, price list, standard letters e.t.c
3. Term papers, reports and books.
4. Production of conference materials and journals.
5. Policy manuals and procedures manuals.
6. Statistical documents.

2d. Advantages of word processing include:

1. Production of personalized letters of a standard form.
2. Easy amendment and updating of files.
3. Ability to produce several copies of document.
4. There is security and confidentiality of document and report by the use of password.
5. Ability of the processor to spell-check document.
6. Storage of documents is possible.
7. Easy correction of errors on document.
8. low error rate in the text.
9. Higher quality for layout of text and printer.
10. User friendly with easy to learn procedures.
11. Use of quieter machine and less bulky equipment.

Examiners' comment

This question tests candidates' knowledge on language translator and some application packages. It demands for the differences among the major computer language processors. It also demands for the definitions and applications of Spread sheet and Word processing packages. Over 70% of the candidates attempted this question and the performance is very good.

3a. (i) **On-line processing**

This is a type of processing in which data is processed as they are fed into the computer. The whole data may be processed immediately or part of it processed and the rest processed later. File reflect a much more up-to-date, a more real picture of a particular set of circumstances. Example: Cash withdrawal from Automated Teller Machine of Banks.

(ii) **Batch Processing**

This is a technique by which data to be processed must be coded and collected into groups or batches prior to processing. A batch consists of a convenient number of records or a collection of records relating to a given period (e.g. daily, weekly, or monthly) or after a specified number is attained to justify updating of a master file.
This processing is efficient, cost effective and suitable for companies that will not require immediate result for further action but involve a degree of delay.

(iii) **Centralized Processing**

This is a kind of processing whereby data is done at a single computer centre. It is a processing mode that is accomplished either by having all the computers in the organization in a centralized or one centre or by having one large central computer with telecommunication links to terminals or other microcomputers at other locations. The unit where data processing takes place is called Electronic Data Processing (EDP) department.

It enhances the effectiveness of the information system department, increases the ability to maintain standards for quality, consistency and maintainability and is less expensive but it leads to delay in information generation and departments cannot maintain independent information.

(iv) Decentralized Processing

This is a processing method whereby data processing facilitates such as hardware, software and personnel are provided at each unit or branches of an organization and each branch or unit is allowed to process their data independently and they do not interact with each other. Each unit has autonomy when it comes to data processing.

It will not lead to delay in generating information, independent information maintained, failure of systems in a branch will not affect others but it is expensive, it can lead to duplication of resources and there is inability to maintain quality standards.

(v) Distributed Processing

This is a kind of processing whereby processing facilities are made available at a number of sites instead of single computer centre. Mini and micro computers are installed at remote sites and each remote site (possibly a branch office) can process its own information independently. Processing functions are distributed to the branches which are connected to the central computer. The central computer oversees the entire system.

Basically, each site is equipped well enough to be able to perform majority of the task, except for some exceptional cases when it will need to rely on the transmission of task to the other sites.

This method minimizes monopoly of information processing, reduces delay in obtaining output from the computer and information are provided as at when required but it is very expensive, and duplication of information by different units within the same organization is possible and there is reduction in control of data.

3b (i) Data communication channel is the path through which data and Information pass from one station/device/user to another. It can be through physical cables or wireless.

(ii) **Examples of physical data communication link/channel include:**

1. Twisted pair cable.
2. Coaxial cable.
3. Fibre-optic cable/Optic fibre cable.

(iii)   Examples of wireless data communication channel include:

1.   Microwave (radio wave).
2.   Satellite link.
3.   Infrared light.
4.   Bluetooth.
5.   Wi-Fi.
6.   Mobile communication system.

Examiners' comment

This question tests candidates' knowledge on processing techniques and communication media.   It demands for the differences among major processing techniques. It also demands for major examples in physical and wireless media. Over 70% of the candidates attempted this question and the performance is very good.

4a   (i)   Electronic commerce (e-commerce) is the use of computer network and internet to conduct business, basically dealing with the buying and selling of goods electronically.

(ii)   The components of e-commerce include:

1.   Supplier and supply chain management.
2.   Warehousing operations.
3.   Shipping and returns.
4.   Clients Relationship Management.
5.   Catalogue and product display.
6.   Marketing and promotion programs.
7.   Showroom and offline purchase.

(iii)   Advantages of e-commerce include:

1.   It reduces physical contact in trade relationship in organizations with large customers.
2.   Timely delivery of quantity goods at reasonable prices by sidelining middlemen.
3.   Facilitates cashless society thereby reducing the risk of carrying up heavy amount of money about.
4.   Provide virtual market where manufacturers and customers can interact electronically.
5.   Remove haggling and stress of buying and selling.

6.   Provide extra-ordinary opportunity for most corporations to sell their products and services 24 hours a day.

7.   It creates a shopping opportunity to buy variety of goods via the internet.

8.   Allows companies to create good image and change the public perception of the companies.

(iv)   **Disadvantages of e-commerce include:**

1.   Risk of loss of job by intermediaries because e-commerce eliminates middlemen in business.

2.   Technological advancement that could be costly to the organization.

3.   Cut-throat competition may kill small businesses.

4.   Poor or obsolete communication facilities.

5.   Erratic and unreliable electricity supply.

6.   Poor implementation of computerization.

7.   Less quality products may be delivered.

8.   Set-up cost is high.

9.   Maintenance cost is high.

10.   E-commerce platform can be hacked.

11.   There is no physical contact between the buyer and the seller.

4b. Uploading is the process through which users or organizations sends files and document to the internet for authorized users to access.

<div align="center">While</div>

Downloading is the process of extracting or getting information, files and documents from the internet for use. E.g. downloading of messages sent to one's e-mail.

Examiners' comment

This question tests candidates' knowledge on e-commerce. It demands for the definition and components of e-commerce. This question seems to be very popular among the candidates but the performance is poor.

The major pitfall is that majority of the candidates' confused components of e-commerce with types of e-commerce.

Candidates are advised to note the difference between components and types of e-commerce in future examinations.

5a (i)   Facilities Management is the management and operation of part or all of an organization's information system services by an external source at an agreed service level and time period.

(ii) **Reasons for using facilities Management include:**

1.   The organization may not have the staff, management time or expertise to organize its information system requirement.
2.   Cost control in that the contract for service may specify the cost in advance and any other cost may be borne by the facilities management company.
3.   Where a number of organizations employ the facilities management company, economies of scale exist.
4.   The need to improve the overall operational efficiency of the information system of the organization.
5.   The need to increase employees' morale thereby increasing the employees' productivity.

5b (i) Grid Computing is the combination of several weak and strong networks in order to make or achieve a strong processing power and storage resources.

OR

This is a combination of interconnected resources spreading all over the whole world thereby having higher computing capabilities.

OR

It is a group of computers connected together via network or internet to perform a dedicated task together such as analyzing e-commerce data or solve complex problem.

(ii) **Application areas of Grid complex include:**

1.   Microprocessor design.
2.   Pharmaceutical industry.
3.   E-learning.
4.   Scientific Application such as geology, astrology etc.
5.   Medical imaging.
6.   Online gaming.
7.   Entertainment industry.
8.   Data Intensive computing.
9.   On demand computing.
10.   Census.
11.   Distributed super computing.
12.   General Election in a country.

(iii) Benefits of Grid Computing include:

1. Access to inaccessible resources.
2. Effective utilization and balancing.
3. There is opportunity for tasks to be performed at their points since the tasks are distributed to avoid overall failure.
4. By using Grid computing, tasks can be migrated to other processors in case of failure of one processor point.
5. Parallel computing and scalability.
6. It can solve larger, more complex problems in a short time.
7. Easier to collaborate with other organizations.
8. Better use of existing hardware.

(iii)b. Lapses of Grid Computing include:

1. Inability to provide solution to problem of large computing and data requirement.
2. If there is no significant difference between two resources, no improvement in performance.
3. More suitable for application that run in a batch mode only.
4. Not very suitable for applications requiring higher graphical user interface.
5. Application not designed in parallel mode cannot use Grid Computing.
6. It can only function effectively with fast interconnection.
7. Some Applications require customization.
8. Licensing problem.
9. They are not interactive for job submission.
10. Grid system is not fully evolved.
11. Learning curve to get started.
12. Difficult in sharing resources across different administrations.
13. Some applications may not work with full potential.

Examiners' comment

This question tests candidates' knowledge on facility management and Grid computing. This question is least popular among the candidates as less than 30% of the candidates attempted this question and the performance is very poor.

Candidates are advised to contact scholarly text material like the ICAN manual (Insight) in preparing for future examinations.

6a. Virtual office is a non-permanent and mobile office run with computers and information technology by using pocket pagers, portable computer, fax machine and various phone network services anywhere without using an office.

6b. **The likely objectives of system analysis phase/state include:**

1. Financial consideration to the organization such as increased wealth, profit or reduced service cost.
2. Improved customer service development.
3. Improved quality, quantity and types of information.
4. Alleviate staff or equipment shortages.
5. Improved efficiency in terms of occurrence and speed of operation, avoid delays and streamline administration.
6. To effect maximum utilization of personnel and equipment.
7. Cost reduction strategies.
8. To increase productivity.
9. Economic necessities arising from new technologies.
10. Improved public relations.

6c. **MODEM** means Modulator Demodulator, which is a device at each end of the telephone line for converting the data from digital to waveform and from waveform to digital form.
<div align="center">**OR**</div>
It is communication equipment that performs the conversion of computers digital signals to analog signal as well as from analog signals to digital signals (modulate-convert digital signal to analog signals, demodulate convert analog signals to digital signals).

MULTIPLEXER is a device that combines two or more input signals from several devices into a single.
Stream of data and transmit it over a communication channel.
<div align="center">**OR**</div>
It is a device that enables a computer to receive data from a numbers of channels at low speeds, convert them into a stream of data and then transmit it at high speed over a communication channel.

6d. **Advantages of using Computer Output on Microfilm (COM) include:**
1. Large volume of information is condensed into a physical storage space.
2. Information can be stored permanently for future use in small space.
3. Film can be indexed by computer to aid in searching for information.

4. The content of COM can be printed out at high speed.
5. It is a cheaper output medium for high volume applications.
6. Frames can be viewed easily on a special COM reader that projects that image on a screen.
7. Microfilm frame or page can be produced on papers or enlarged readable forms when and if required.

Examiners' comment

This question tests candidates' knowledge on the concept of Virtual office, System Development, Terminal equipment and storage devices. It demands for the definition of Virtual office and the objective of System Analysis phase in system development.

It also demanded for the difference between MODEM and Multiplexor. This question is simple and straight forward but only few candidates attempted it. The performance in this question is very poor.

ICAN study pack **(Insight)** is recommended for future examinations.