

Roll No.

Total No. of Questions – 7

Total No. of Printed Pages – 16

Time Allowed – 3 Hours

Maximum Marks – 100

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Answer to questions are to be given only in English except in the case of candidates who have opted for Hindi Medium. If a candidate has not opted for Hindi Medium, his / her answers in Hindi will not be valued.

No statistical or other table will be distributed along with this question paper. Situations given in theory questions need not be copied into the answer books.

Working Notes should form part of the answer.

Question No. 1 is compulsory.

Attempt any **five** questions from the remaining **six** questions.

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1. (a) PQR Ltd., a manufacturer of tool kits has just completed XY's domestic order of 100 kits at a price of ₹ 1650 per kit. The details of cost for XY's order are : **5**

	Cost (₹)
Direct Material	90,000
Direct Labour	32,000
Tools and Consumables	16,400
Variable overheads	9,600
Fixed overheads (allocated)	15,000
Total	1,63,000

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The company wishes to evaluate a special export order from Expo Ltd. of similar 300 kits at ₹ 1,600 per kit. For the export order, special packing has to be done at ₹ 20 per kit. An additional fixed inspection cost specific to this export order has to be incurred. The allocation of fixed overheads will be revised to increase by ₹ 25,000. Tools and Consumables above include special purpose tools costing ₹ 10,000 incurred for XY's order and these can be reused for the export order and the remaining portion is variable. PQR Ltd. wishes to accept the export order at 10% profit on the selling price.

What should be the maximum amount that can be incurred as inspection cost for making such an acceptance possible ?

If Expo Ltd. offers to take the products without inspection, what is the maximum discount (as a percentage of the existing export price) that PQR Ltd. can offer to retain its 10% profit on the revised selling price ? (Round off calculations to two decimal places).

- (b) A company processes different products from a certain raw material. 5
The raw material is processed in process I (where normal loss is 10% of input) to give products A and B in the ratio 3 : 2. B is sold directly. A is processed further in process II (where normal loss is 12.5% of output) to give products C and D in the ratio 5 : 3. At this point C and D have sale values ₹ 55 and ₹ 40 per kg respectively. C can be processed further in process III with processing cost ₹ 3,95,600 and normal wastage 5% of input and then be sold at ₹ 66 per kg. D can be processed further in process IV with processing cost ₹ 3,82,500 and normal wastage 12.5% of output and then be sold at ₹ 55 per kg. The normal wastage of each process has no realizable value. During the production period, 2,00,000 kgs of raw material is to be introduced into Process I.

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Using incremental cost-revenue approach, advise whether sale at split-off or further processing is better for each of the products C and D.

- (c) A Ltd. is going to introduce Total Quality Management (TQM) in its company. State whether and why the following are valid or not for the successful implementation of TQM. 5
- (i) Some departments serve both the external and internal customers. These departments have been advised to focus on satisfying the needs of the external customers.
 - (ii) Hold a training program at the beginning of a production cycle to ensure the implementation of TQM.
 - (iii) Implement Management by Objectives for faster achievement of TQM.
 - (iv) Appoint the Head of each department as the person responsible to develop improvement strategies and performance measures.
 - (v) Eliminate wastage of time by avoiding documentation and procedures.
- (d) A salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. Cost (in ₹ '000) of travelling from one city to another is given below. You are required to find out the least cost route. 5

To \ From	P	Q	R	S	T
P	–	6	12	4	6
Q	6	–	10	4	6
R	12	10	–	12	8
S	4	4	12	–	12
T	6	6	8	12	–

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2. (a) AXE Ltd. manufactures four products A, B, C and D. The following details are available for a production period : 10

	A	B	C	D
Selling price	100	109	121	124
Material cost	40	42	46	40
Labour cost :				
Assembly Dept. @ ₹ 10 per hour	15	20	15	20
Machine Dept. @ ₹ 12 per hour	18	24	36	30
Variable overheads @ ₹ 4 per labour hour in assembly dept.	6	8	6	8
Maximum external demand (units)	40,000	55,000	36,000	30,000

Total fixed cost is dependent on the output level and is tabulated below at different levels of output :

Production units (any combination of one or more of any of A, B, C or D)	Total fixed cost (in ₹)
Zero to 1,00,000 units	8,43,000
1,00,001 to 1,50,000 units	12,50,000
1,50,001 to 2,00,000 units	16,00,000

Production facilities can be interchangeably used among the products.

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Labour availability in the assembly department is limited to 2,20,000 hours for the production period. A local firm has offered to make any quantity of any of the products on a sub-contract basis at the following rates :

	A	B	C	D
Sub-contract Price (₹/unit)	85	95	101	100

- (i) Advise the management on how many units of each product are to be manufactured or subcontracted to fulfill maximum market demand. What would be the corresponding profits ?
- (ii) What is the minimum number of units to be produced to achieve break-even point ?
- (iii) What would you advise as the best strategy to maximize profits if assembly labour is not a limiting factor and if there is no compulsion to fulfill market demand ?
- (Only relevant figures need to be discussed. A detailed profitability statement is not required).
- (b) A computer service centre services laptops. It is proposed to study the arrival and servicing pattern of the service centre. The following information was collected over a period of 100 days.

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No. of computers	Frequency of arrival	Frequency of service
8	10	15
9	25	20
10	20	25
11	15	16
12	18	14
13	12	10

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Simulate the arrival and servicing pattern for 10 days and find out the average number of laptops held for more than one day for service. Assume FIFO method is followed for service/repair and there is one laptop held from previous day for repair at the beginning of the first day.

Use the following series of random numbers :

Arrivals	69	45	46	10	82	16	35	70	57	92
Service	52	36	62	49	68	77	55	66	51	88

3. (a) RST Ltd. has provided the following summarized results for two years : 10

	Year ended (₹ in lacs)	
	31-03-2013	31-3-2014
Sales	3,000	3,277.50
Material	2,000	2,357.50
Variable overheads	500	525.00
Fixed overheads	300	367.50
Profit	200	27.50

During the year ended 31-3-2014 sale price has increased by 15% whereas material and overhead prices have increased by 15% and 5% respectively. You are required to analyse the variances of revenue and each element of cost over the year in order to bring out the reasons for the change in profit. Present a profit reconciliation statement starting from profits in 2012-13 showing the factors responsible for the change in profits in 2013-14.

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- (b) A factory produces 3 products X_1 , X_2 and X_3 . Each of these products is processed in two departments, machining and Assembly. The processing time in hours for each product in each department and the total available time in hours in the departments and contribution per unit are given below :

Product	Processing time (in hours)		Contribution ₹/unit
	Machining Department	Assembly Department	
X_1	4	3	8
X_2	4	2	6
X_3	6	4	5
Available time (hours)	384	288	

Exactly 30 units of X_3 must be produced.

- Determine the optimal product mix using simplex method and find the optimal profit.
- Comment on the solution, objective function and the constraints.

- ✓ 4. (a) PQR Ltd. specializes in the distribution of pharmaceutical products. It buys from pharmaceutical companies and resells to each of the three different markets :
- General Supermarket chains

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(ii) Drug Store chains

(iii) Chemist shops

The company plans to use activity based costing for analyzing the profitability of its distribution channels. The following data for the quarter ending March 2014 is given :

	General supermarket chains	Drug store chains	Chemist shops
Average sales per delivery ✓	₹ 96,500	₹ 32,450	₹ 6,225
Average cost of goods sold per delivery	₹ 94,650	₹ 31,800	₹ 5,950
Number of deliveries	960	2,470	8,570
Total number of orders	1,000	2,650	9,500
Average number of cartons shipped per delivery	250	75	12
Average number of hours of shelf stocking per delivery	2	0.5	0.1

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The following information is available in respect of operating costs (other than cost of goods sold) for the quarter ending March 2014 :

Activity Area	Cost driver	Total cost (₹)
Customer purchase order processing	Purchase order by customers →	5,91,750
Customer store delivery	Number of deliveries	9,60,000
Cartons dispatched to customer stores	Number of Cartons dispatched to customer stores	7,92,135
Shelf stocking at customer store	Hours of shelf stocking	80,240

Compute the operating income of each distribution channel for the quarter ending March 2014 using activity based costing.

(b) The following table relates to a network :

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Activity	Normal time (days)	Crash time (days)	Normal Cost (₹)	Crash Cost (₹)
1 – 2	5	4	30,000	40,000
2 – 3	6	4	48,000	70,000
2 – 4	8	7	1,25,000	1,50,000
2 – 5	9	6	75,000	1,20,000
3 – 4	5	4	82,000	1,00,000
4 – 5	7	5	50,000	84,000

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The overhead cost per day is ₹ 5,000 and the contract includes a penalty clause of ₹ 15,000 per day if the project is not completed in 20 days.

- (i) Draw the network and calculate the normal duration and its cost.
- (ii) Find out :
 - (1) the lowest cost and the associated time
 - (2) the lowest time and the associated cost.

5. (a) Divisions X and Y are two divisions in XY Ltd. Division X manufactures a component (X) which is sold to external customers and also to Division Y.

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Details of Division X are as follows :

Market price per component	₹ 300
Variable cost per component	₹ 157
Fixed costs per production period	₹ 20,62,000
Demand from Y Division per production period	20,000 components
Capacity per production period	<u>35,000 components</u>

Division Y assembles a product (Y) which is sold to external customers. Each unit of Y requires two units of X.

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Details of Division Y are as follows :

Selling price per unit	₹ 1,200
Variable cost per unit :	
(i) Two components from X	2 @ transfer price
(ii) Other variable costs per unit	₹ 375
Fixed costs per production period	₹ 13,50,000
Demand per production period	10,000 units
Capacity per production period	10,000 units

The Group Transfer Pricing Policy stipulates that

Transfers must be at opportunity cost.Y must buy the components from X.

X must satisfy the demand from Y before making external sales.

- (i) Present figures showing the weighted average transfer price per component transferred to Y and the total profits earned by X for each of the following levels of external demand of X :

External demand = 15,000 components

External demand = 19,000 components

External demand = 35,000 components

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- (ii) Compute Division Y's profits when Division X has each of the above levels of demand.

(Only relevant figures need to be discussed. A detailed profitability statement for each situation is not required).

- (b) Buildico, a company that builds houses presents the following facts 8 relating to a certain housing contract that it wishes to undertake :

The CEO's and Marketing Director's food and hotel expenses of ₹ 3,750 were incurred for a meeting with a prospective client.

1200 kgs of raw material Z will be required for the house. Inventory of Z available is 550 kg. It was purchased at ₹ 580 per kg. It is used by Buildico in other projects. Its current market price is ₹ 650 per kg. Its resale value is ₹ 350 per kg.

The house will require 90 hours of engineer's time. The engineers are paid a fixed monthly salary of ₹ 47,500 per engineer who can work 150 hours a month. Spare time is not available now and an engineer has to be hired for this house for one month. He cannot be used in any other project once he does this contract.

Buildico will use a special earthquake proof foundation material. This was developed by Buildico at a cost of ₹ 30,000 for some other project that had to be abandoned. If it does not use it in this project, it can use it in some other project and charge the client ₹ 50,000 for it.

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A list of items is given below. You are required to name the type of cost and state whether it is relevant or not in calculating the cost of the given housing project :

Sl. No.	Item	Type of cost	Relevant (R) / Irrelevant (IR)
1	Food and hotel expenses ₹ 3,750		
2 (i)	Material Z : 550 kg × ₹ 580/kg		
(ii)	Material Z : 550 kg × ₹ 650 per kg		
3. (i)	Engineer's salary ₹ 47,500		
(ii)	Engineer's free time cost 60/150 × 47,500		
4. (i)	Design cost ₹ 30,000		
(ii)	Design cost ₹ 50,000		

6. (a) DEF Ltd manufactures and sells a single product and has estimated sales revenue of ₹397.80 lacs during the year based on 20 % profit on selling price. Each unit of product requires 6 kg of material A and 3 kg of material B and processing time of 4 hours in machine shop and 2 hours in assembly shop. Factory overheads are absorbed at a blanket rate of 20 % of direct labour. Variable selling & distribution overheads are ₹ 6 per unit sold and fixed selling & distribution overheads are estimated to be ₹ 7,20,000.

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The other relevant details are as under :

Purchase price	Material A	₹ 16 per kg
	Materials B	₹ 10 per kg
Labour rate	Machine Shop	₹ 14 per hour
	Assembly Shop	₹ 7 per hour

	Finished Stock	Material A	Material B
Opening Stock	25,000 units	75,000 kg	40,000 kg
Closing Stock	30,000 units	80,000 kg	55,000 kg

You are required to calculate :

- Number of units of product proposed to be sold and selling price per unit.
 - Production budget in units.
 - Material purchase budget in units.
- (b) Y Limited is a manufacturer of Cardboard boxes. An analysis of its operating income between 2012 and 2013 shows the following :

	Income Statement (amount in 2012)	Revenue & Cost effect of Growth component in 2013	Revenue & Cost effect of Price recovery component in 2013	Cost effect of productivity component in 2013	Income Statement (amount in 2013)
Revenue (₹)	40,00,000	2,00,000 (F)	4,20,000 (F)	—	46,20,000
Costs (₹)	29,20,000	60,000 (A)	2,56,000 (A)	58,000 (F)	31,78,000
Operating Income (₹)	10,80,000	1,40,000 (F)	1,64,000 (F)	58,000 (F)	14,42,000

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Y limited sold 4,00,000 boxes and 4,20,000 boxes in 2012 and 2013 respectively. During 2013 the market for cardboard boxes grew 3% in terms of number of units and all other changes are due to company's differentiation strategy and productivity. Compute how much of the change in operating income from 2012 to 2013 is due to the industry market size factor, productivity and product differentiation and also reconcile the profit of both years due to these factors.

- (c) Can there be (i) more than one dummy row or column or (ii) one dummy row and a dummy column in a given problem of (a) assignment (b) transportation ? Why ? (In other words, state whether and why each of situations A, B, C and D is possible or not) : 4

	Assignment	Transportation
More than one dummy row or column	A	B
One dummy row and one dummy column	C	D

7. Answer any **four** out of the following **five** questions :

4×4
=16

- (a) How is Pareto analysis helpful in pricing of products in the case of a firm dealing with multiple products ?
- (b) Discuss the benefits of Customer Profitability Analysis.

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- (c) Classify the following items appropriately under the three measures used in the Theory of Constraints :

Sl. No.	Item
(i)	Research and Development Cost
(ii)	Rent/Utilities
(iii)	Finished goods inventory
(iv)	Depreciation
(v)	Labour Cost
(vi)	Stock of Raw Materials
(vii)	Sales
(viii)	Cost of equipment and buildings

- (d) Will the solution for a minimization problem obtained by Vogel's Approximation Method and Least Cost Method be the same ? Why ?
- (e) In a 3×4 transportation problem for minimizing costs, will the R_2C_1 cell (at the intersection of the 2nd row and 1st column) always figure in the initial solution by the North West Corner Rule ? Why ?

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