

2022

1st Semester Examination

COMMERCE

Paper : COM 104

(Quantitative Techniques for Managerial
Decisions)

Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

COM : 104.1

1. Answer any *two* of the following questions : $5 \times 2 = 10$

- (a) What is linear programming? What do you understand by degeneracy in Simplex solution of linear programming problem? 2+3
- (b) What do you understand by an unbalanced transportation problem? What will you do when a transportation problem is found to be unbalanced? 2+3
- (c) State briefly the Hungarian method of solving an assignment problem. 5

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2. Answer any *one* of the following questions : $10 \times 1 = 10$

- (a) A company produces two products A and B, each of which requires three types of processing. The length of time for processing of each unit of A and B, and the profit per unit are given in the following table.

	Product A (hrs/unit)	Product B (hrs/unit)	Available capacity per day (hr)
Process I	120	120	8,400
Process II	30	60	3,000
Process III	80	40	4,800
Profit per unit (Rs.)	50	70	—

How many units of each product should the company produce per day in order to maximize its profit? (Apply Simplex Method). 10

- (b) A company has factories at F1, F2 and F3 which supply warehouses at W1, W2 and W3. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouses requirements are 180, 120, and 150 units respectively. Unit shipping costs (Rs.) are as follows :

		Warehouses		
		W1	W2	W3
Factories	F1	16	20	12
	F2	14	8	18
	F3	26	24	16

Determine the optimal distribution for this company to minimize its shipping costs. 10

COM : 104.2

3. Answer any *two* of the following questions : $5 \times 2 = 10$

(a) Distinguish between PERT and CPM in network analysis. 5

(b) Briefly explain about the different types of costs involved in inventory management system. 5

(c) In the production shop of a company, the breakdown of machines is found to be Poisson with an average rate of 3 machines per hour. Breakdown time at one machine costs Rs. 400 per hour to the company. There are two choices before the company for hiring the repairmen. One of the repairman is slow but cheap, the other is fast but expensive. The slow-cheap repairman demands Rs. 200 per hour and will repair the broken down machines exponentially at the rate of 4 per hour. The fast - expensive repairman demands Rs. 300 per hour and will repair machines exponentially at an average rate of 6 per hour. Which repairman should be hired? 5

4. Answer any *one* of the following questions : $10 \times 1 = 10$

(a) A shopkeeper has a uniform demand of an item at the rate of 100 items per month. He buys the

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item from a supplier at a cost of Rs. 12 per unit and the ordering cost comes to be Rs. 10 per order. If the stock holding costs are 20% on unit cost, find the economic ordering quantity of the shopkeeper.

Further, suppose the supplier offers the following quantity discount-

Quantity	Price per unit (Rs.)
$0 \leq Q_1 < 200$	12.00
$200 \leq Q_2 < 1000$	11.40 (5% discount)
$1000 \leq Q_3$	10.80 (10% discount)

Should the shopkeeper revise his ordering quantity to minimize total annual cost? 10

(b) The following table gives the activities in a construction project and other relevant information.

Activity	Immediate predecessor	Time (days)		Direct cost (Rs.)	
		Normal	Crash	Normal	Crash
A	—	4	3	60	90
B	—	6	4	150	250
C	—	2	1	38	60
D	A	5	3	150	250
E	C	2	2	100	100
F	A	7	5	115	175
G	D, B, E	4	2	100	240

Indirect costs vary as follows :

Days	15	14	13	12	11	10	9	8	7	6
Cost (Rs.)	600	500	400	250	175	100	75	50	35	25

Required :

- (i) Draw an arrow diagram for the project.
- (ii) Determine the optimal project duration which will result in minimum total project cost. 3+7
