

2021

BUSINESS ADMINISTRATION — HONOURS

Paper : A501 (C-11)

(Quantitative Techniques for Management)

Full Marks : 80

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **any eight** questions from the following.

1. A company is making two products A and B. The cost of producing one unit of product A and B is ₹ 60 and ₹ 80, respectively. As per the agreement, the company has to supply at least 200 units of product B to its regular customers. One unit of product A requires one machine hour whereas product B has machine hours available abundantly within the company. Total machine hours available for product A are 400 hours. One unit of each product A and B requires one labour hour each and total of 500 labour hours are available. The company wants to minimize the cost of production by satisfying the given requirements. Formulate the problem as Linear Programming Problem. 10

2. A small-scale manufacturer has production facilities for producing two different products. Each of the products requires three different operations : grinding, assembly and testing. Product 1 requires 15, 20 and 10 minutes to grind, assembly and test respectively; whereas product 2 requires 7.5, 40 and 45 minutes for grinding, assembling and testing. The production run calls at least 7.5 hours of grinding time, at least 20 hours of assembling time, and at least 15 hours of test time. If Product 1 costs ₹ 60 and Product 2 costs ₹ 90 to manufacture; determine the number of units of each product the firm should produce in order to minimize the cost of operations. Solve it graphically. 10

3. Solve the following L.P.P. by Simplex method.

$$\text{Maximize } Z = 800X_1 + 600X_2 + 300X_3$$

Subject to the Constraints :

$$10X_1 + 4X_2 + 5X_3 \leq 2000$$

$$2X_1 + 5X_2 + 4X_3 \leq 1009$$

$$\text{And } X_1, X_2, X_3 \geq 0$$

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Please Turn Over

4. ABC Co. is engaged in manufacturing five brands of packed snacks. It is having five manufacturing set-ups, each capable of manufacturing any of its brands one at a time. The cost to make a brand on these set-ups vary according to the following table :

Set-ups \ Brand	S ₁	S ₂	S ₃	S ₄	S ₅
B ₁	4	6	7	5	11
B ₂	7	3	6	9	5
B ₃	8	5	4	6	9
B ₄	9	12	7	11	10
B ₅	7	5	9	8	11

Assuming five set-ups are S₁, S₂, S₃, S₄ and S₅ and five brands are B₁, B₂, B₃, B₄ and B₅.

Find the optimal assignment of products on these set-ups resulting in minimum cost. Use Hungarian method. 10

5. Find initial feasible solution of the following transportation problem by “North-West Corner Rule”.

Destination

S	From \ To	Destination				Supply
		P	Q	R	T	
O	A	4	6	8	13	50
U	B	13	11	10	8	70
R	C	14	4	10	13	30
C	D	9	11	13	8	50
E	Demand	40	35	105	20	200

(3)

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6. Obtain an initial basic feasible solution to the following transportation problem by ‘Vogel’s Approximation Method’.

Warehouse	Stores				Availability
	I	II	III	IV	
A	7	3	5	5	34
B	5	5	7	6	15
C	8	6	6	5	12
D	6	1	6	4	19
Demand	21	25	17	17	80

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7. Draw a network from the following activities and find a Critical Path and Duration of the Project.

Activity	Duration (days)
1 – 2	10
2 – 3	8
3 – 4	12
3 – 5	13
4 – 6	7
5 – 6	11
5 – 7	7
6 – 8	9
7 – 8	6
8 – 9	15
9 – 10	17

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Please Turn Over

8. A Project has the following activities and other characteristics :

Activity	Proceeding Activity	Time Estimates (in weeks)		
		Most Optimistic	Most Likely	Most Pessimistic
A	Nil	4	7	16
B	Nil	1	5	15
C	A	6	12	30
D	A	2	5	8
E	C	5	11	17
F	D	3	6	15
G	B	3	9	27
H	E, F	1	4	7
I	G	4	19	28

(a) Draw a PERT network diagram

(b) Identify the critical Path

(c) Find the expected duration and variance for each activity.

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9. Find the dual of the following problem :

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$$\text{Minimize } Z = X_1 + X_2 + X_3$$

Subject to the constraints

$$X_1 - 3X_2 + 4X_3 = 5$$

$$X_1 - 2X_2 \leq 3$$

$$X_1, X_2 \geq 0 \text{ and } X_3 \text{ is unrestricted.}$$

10. A newspaper distributor assigns probabilities to the demand for a magazine as follows :

Copies Demanded	1	2	3	4
Probability	0.4	0.3	0.2	0.1

A copy of the magazine sells for ₹ 7 and costs ₹ 6. What can be the maximum possible expected monetary value (EMV) if the distributor can return unsold copies for 5 each?

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(5)

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11. Find out the Saddle Point, given the following pay-off matrix :

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Player B's Strategy

	B ₁	B ₂	B ₃	
Player A's Strategy	A ₁	24	- 10	- 5
	A ₂	12	14	7
	A ₃	- 15	-12	5

12. Write short notes on :

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- (a) Two Person Zero Sum Game
 - (b) Saddle Point
 - (c) Strategy.
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