

13 APR 2019

PAPER CODE : 21866

B. Sc Semester- VI Examination, Apr. 2019

STAT -CC- 606 [Advanced Operations research Techniques]

TIME: 2½ Hours

Marks: 70

INSTRUCTIONS: 1) There are 5 compulsory questions in this question paper.

2) Use of Scientific calculator is allowed.

3) Graph paper will be provided on request.

1. (a) Explain the role of Slack variable, Surplus variable and Artificial variable in Linear Programming Problem. 6

(b) A person requires 10, 12 and 12 units of chemical A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per jar. A dry product contents 1, 2 and 4 units of A, B and C respectively. If the liquid product sells for Rs. 3/- per jar and dry product for Rs. 2/- per carton. 8

Use duality to find how many of each should be purchased in order to minimize the cost & meet the requirements?

OR

1. (a) Give the relationship between primal and dual linear programming problem. 6

(b) Use Charne's big penalty technique to find an optimal solution of the following Linear Programming Problem- 8

$$\text{Maximize } Z = 3X_1 + 2X_2 + 5X_3$$

$$\text{Subject to : } X_1 + 2X_2 + X_3 \leq 430;$$

$$3X_1 + 2X_3 \leq 460;$$

$$\text{And } X_1 + 4X_3 \leq 420;$$

$$X_1 \geq 0 ; X_2 \geq 0$$

2. (a) Explain the Vogel's Approximation Method' of finding initial solution of a Transportation Problem. 6

(b) A city corporation has decided to carry out road repairs on main four arteries of the city. The government has agreed to make a special grant of Rs. 50 lakh towards the cost with a condition that the repairs are done at the lowest cost and quickest time. If the conditions warrant, a supplementary token grant will also be considered favorably. The corporation has floated tenders and five contractors have sent in their bids. In order to expedite work, one road will be awarded to one contractor only. 8

i. Find the best way of assigning the repair work to the contractors and the costs.

ii. Which of the five contractors will be unsuccessful in his bid?

Cost of repairs (Rs. Lakh)				
Contractors	Road			
	R ₁	R ₂	R ₃	R ₄
C ₁	9	14	19	15
C ₂	7	17	20	19
C ₃	9	18	21	18
C ₄	10	12	18	19
C ₅	10	15	21	16

OR

2. (a) What is the problem of Assignment? Give the mathematical formulation of assignment problem. 6
- (b) A company manufacturing air-coolers has two plants located at Bombay and Kolkota with a capacity of 200 units and 100 units per weeks respectively. The company supply air coolers to its four showrooms situated in Ranchi, Delhi, Lucknow and Kanpur, which have maximum demand of 75, 100, 100 and 30 units respectively. Due to the differences in raw material cost and transportation cost, the profit per unit in rupees differs which is shown in the table below:

Plants ↓ Showrooms →	Ranchi	Delhi	Lucknow	Kanpur
Bombay	90	90	100	100
Kolkota	50	70	130	85

Plan the production schedule so as to maximize the profit.

3. (a) Explain the terms: 8
- i) Pure strategy ii) Mixed Strategy,
 iii) Rectangular games iv) Saddle Point.
- (b) Use dominance property to solve the following game: 6

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

OR

3. (a) What is rectangular game? Explain the algebraic method for solving a rectangular game. 8

(b) Solve the following game:

6

		<i>Player B</i>			
		<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>
<i>Player A</i>	<i>I</i>	20	15	12	35
	<i>II</i>	25	4	05	10
	<i>III</i>	40	02	08	05
	<i>IV</i>	-5	4	0	0

4. (a) Give distinguish between – CPM and PERT. 6

(b) The following table gives the activities in construction project and time duration. 8

Activity	Predecessor Activity	Duration (in days)
A	-	20
B	-	25
C	A	10
D	A	12
E	B,C	5
F	D,E	10

i. Draw the project network.

ii. Determine critical path and the total project duration.

OR

4. (a) What do you mean by Critical Path? Explain 'Forward pass method' and 'Backward pass method' for finding Earliest & Latest Occurrence Time of events. 8

(b) State the advantages and disadvantages of PERT. 6

5. (a) What is the need of Simulation? State various areas, where the Simulation is successfully used? 6

(b) The maintenance cost (Rs) and resale value per year of a machine whose purchase price is Rs. 7000 is given below. When should the machine be replaced? 8

Year	1	2	3	4	5	6	7	8
Maintenance cost	900	1200	1600	2100	2800	3700	4700	5900
Resale value (Rs)	4000	2000	1200	600	500	400	400	400

OR

5. (a) Explain 'Monte Carlo Simulation' technique. State the advantages and disadvantages of Simulation. 9

(b) Write a note on , ' Group replacement and Individual Replacement policy.' 5