AF-116

April-2015

B.Sc., Sem.-VI :

STA-310 : STATISTICS

(Operations Research)

Time : 3 Hours]   **[Max. Marks : 70**

Instructions :   (i)   **All** questions carry equal marks.

                  (ii)   Scientific calculator is allowed.

1. (a) Write the algorithm to solve a linear programming problem by simplex method.   **7**

OR

Write general form of Linear Programming Problem also with reference to LPP. define the following terms :

(i)   Optimum solution

(ii)   Feasible solution

(iii)   Artificial variables

(b) Define Duality in linear programming problem.   **7**

Prove that dual of dual is primal. Verify the above statement for the following linear programming problem :

Maximize $Z = 20X_1 + 10X_2$

Subject to $4X_1 + 8X_2 \geq 32$, $2X_1 + 10X_2 \geq 30$; $X_1 \geq 0, X_2 \geq 0$.

OR

A manufacturer has two machines A and B. He manufactures two products P and Q on these machines. For manufacturing product P he has to use machine A for 3 hours and machine B for 6 hours, and for manufacture product Q he has to use machine A for 6 hours and machine B for 5 hours. On each unit of P he earns ₹ 4 and on each unit of Q he earns ₹ 5. How many units of P and Q should be manufactured to get maximum profit ? Each machine cannot be used for more than 2100 hours.

2. (a) What is transportation problem ? Explain general transportation table and give its mathematical form. **7**

OR

Explain transportation problem as a particular case of linear programming problem. Also solve the following transportation problem by VAM and obtain the optimum solution to minimize the total transportation cost :

| | | Destinations | | | | Supply |
		D_1	D_2	D_3	D_4	
Origins	O_1	21	13	25	13	11
	O_2	17	18	14	23	13
	O_3	32	27	18	41	19
Requirement		6	10	12	15	

(b) What is assignment problem ? Explain Hungarian method to solve assignment problem. How will you deal with unbalanced Assignment problem ? **7**

OR

Give comparison between transportation problem and assignment problem.

3. (a) Explain the Johnson's procedure to determine an optimum sequence for processing n items on 2 machines. **7**

OR

The cost price of an item is ₹ 7,000. Annual operating cost is ₹ 300 for the first year and then increases by ₹ 1500 every year. After how many years should the item be replaced ?

(b) A machine costs ₹ 9,500. Its annual maintenance cost and resale price for every year are given below. Determine at which year it is advisable to replace the machine. **7**

Year	1	2	3	4	5	6
Maintenance Cost (₹)	400	600	700	1000	2000	3000
Resale price (₹)	8000	6000	5000	2000	1000	500

OR

State the use of replacement theory.

A machine cost ₹ 12,200 and its scrap value is ₹ 200, a constant. Its maintenance expense is known from the past experience as follows. After how many years should the machine be replaced ?

Year	1	2	3	4	5	6	7	8
Maintenance Cost (₹)	200	500	800	1200	1800	2500	3200	4000

4. (a) Explain the following with reference to PERT : **7**

    (i) Activity

    (ii) Event

    (iii) Expected Time

    (iv) Optimistic time

    (v) Pessimistic time

    (vi) Most likely time

    (vii) Total Float

OR

Give full-form of PERT and CPM. Give the difference between PERT and CPM.

(b) A project consists of a series of tasks labeled A, B, C, D, E, F, G, H, I with following relationships. Construct a PERT network having the following constraints. Also determine the critical path. **7**

A < B, C; C < E; B < D, F; E, D < G; G, F < H; H < I

TASK :	A	B	C	D	E	F	G	H	I
TIME :	15	18	18	14	24	16	20	13	9

OR

For the project consisting of the following activities, draw network for the project and determine the critical path, total float, free float.

Activity :	1-2	1-3	1-4	2-4	3-4	4-5
Activity (time) :	20	25	10	12	6	10

5.   Write answers in brief :   **14**

   (i)   What is degenerate basic feasible solution ?

   (ii)   What is the main limitation of graphical method of solving linear programming problem ?

   (iii) Define the term : Decision variables.

   (iv)   What do you mean by balanced transportation problem ?

   (v)   How many solutions can be obtained for an assignment problem of order 5×5 ?

   (vi)   What is the nature of average maintenance cost for replacement problem ?

   (vii) What is replacement problem ?

   (viii) Give the formula for calculating expected time of an activity.

   (ix)   What float time means ?

   (x)   What is the role of Slake and Surplus variable in LPP ?

   (xi)   Which method is best to obtain optimum solution in transportation problem ?

   (xii) State the mathematical form of assignment problem.

   (xiii) Define : Linear Programming problem.

   (xiv) What do you mean by dummy activity ?

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