

Rishi Bankim Chandra Evening College

M.Com. 2nd Semester Examination, 2022

Quantitative Techniques

(COMPCOR09T)

Time – 2 Hours

F.M.-40

Group – A

Answer any **Five** questions from the following:

2×5=10

1. What are the differences between pure and mixed strategies of game theory?
2. What is key row and how is it selected in the simplex method?
3. When does an LPP possess a pseudo-optimal solution?
4. Define two-person zero sum game.
5. What are slack and surplus variables?
6. How can we resolve degeneracy in a LPP?
7. Define shortage cost.
8. What do you mean by degeneracy in a transportation problem?

Group – B

Part I

Answer any **ONE** question from the following:

1×5=5

9. Use the simplex method to solve the following LP problem.

$$\begin{aligned} &\text{Maximize} && Z = 3x_1 + 5x_2 + 4x_3 \\ &\text{Subject to the constraints:} && 2x_1 + 3x_2 \leq 8 \\ &&& 2x_2 + 5x_3 \leq 10 \\ &&& 3x_1 + 2x_2 + 4x_3 \leq 15 \\ &&& x_1, x_2, x_3 \geq 0 \end{aligned}$$

10. For the game with payoff matrix :

Player B

Player A	B1	B2	B3
A1	-1	2	-2
A2	6	4	-6

Determine the optimal strategies for players A and B. Also determine the value of the game.

Part II

Answer any **ONE** question from the following:

1×5=5

11. A company manufactures two products A and B. Each unit of B takes twice as long as to produce one unit of A and if the company is to produce only A, it would have time to produce 2000 units per day. The availability of the raw material is sufficient to produce 1500 units per day of both A and B combined. Product B requiring a special ingredient, only 600 units can be prepared per day. If A fetches a profit of Rs. 2 per unit and B, a profit of Rs. 4 per unit. Formulate the problem as LPP and explain the formulation process.

12. Solve the assignment problem :

	1	2	3
A	7	5	6
B	8	4	7
	9	6	4

Group – C

Part I

Answer any **ONE** question from the following:

1×10=10

- 13.a) The following table shows the jobs of a network along with their time estimates. The time estimates are in days.

Job	Optimistic	Most likely	Pessimistic
1-2	3	6	15
1-6	2	5	14
2-3	6	12	30
2-4	2	5	8
3-5	5	11	17
4-5	3	6	15
5-8	1	4	7
6-7	3	9	27
7-8	4	19	28

- Draw a project network.
- Find the critical path.

- iii) Find the probability of the project being completed in 31 day
 [Given $\phi(2.166)=0.4886$]

$$4+3+3=10$$

14. Write the dual of the following primal LPP,

$$\begin{aligned} \text{Min} \quad & Z = 4x_1 + 5x_2 - 3x_3 \\ \text{Subject to,} \quad & x_1 + x_2 + x_3 = 22 \\ & 3x_1 + 5x_2 - 2x_3 \leq 65 \\ & x_1 + 7x_2 + 4x_3 \geq 120 \\ & x_1, x_2 \geq 0 \text{ and } x_3 \text{ is unrestricted.} \end{aligned} \quad 10$$

Part II

Answer any **ONE** question from the following: 1×10=10

15. A company makes two kinds of leather belts A and B. The respective profits are Rs. 40 and Rs. 25 per belt. Each belt of type -A requires twice as much time as a belt of type-B and if all belts were of type B, the company could make 1000 per day. The supply of leather is sufficient for only 1200 belts per day (both A and B). Belt- A requires a fancy buckle and only 500 per day are available. There are only 900 buckles per day available of belt-B. Formulate a linear programming problem and solve it graphically to find out optimal product mix.

16. A project consists of 9 activities whose time estimates(in weeks) and other characteristics are given below :

Activity	Preceding activity	Optimistic	Most likely	Pessimistic
A	-	2	4	6
B	-	6	6	6
C	-	6	12	24
D	A	2	5	8
E	A	11	14	23
F	B,D	8	10	12
G	B,D	3	6	9
H	C,F	9	15	27
I	E	4	10	16

- a) Draw the network of the project.
- b) What are the project completion time and its variance?
- c) What is the probability of completing the project one week before the expected time? [Given $\Phi(0.30) = 0.6179$]

$$4+3+3=10$$