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Master of Commerce 2nd Semester

(2042)

OPERATIONS RESEARCH

(Same for USOL Candidates)

Paper : MC-205

Time Allowed : Three Hours] **[Maximum Marks : 80**

Note :—Attempt **FIVE** questions in all, taking at least **ONE** from each unit.

UNIT—I

1. (a) What is a Linear Programming Problem ? Explain how you will formulate a mathematical model to a given linear programming problem.

   (b) A publisher of books can earn a profit of Rs. 24 and Rs. 23 respectively by selling a cloth-bound and paper-bound book. It takes 10 minutes to bind a cloth cover and 9 minutes to bind a paper cover. The total available time for binding is 800 hours. It is predicted that the cloth bound book sales will exceed 3000 copies but the

paperback sales will not be more than 4000 copies. Formulate the problem as a Linear Programming problem and find the optimal solution by graphical method.

8,8

2. Solve the following Linear programming Problem :

Maximize $z = 3x_1 + 4x_2$

Subject to the constraints :

$5x_1 + 4x_2 \leq 200$

$3x_1 + 5x_2 \leq 150$

$5x_1 + 4x_2 \geq 100$

$5x_1 + 4x_2 \geq 80$

$x_1, x_2 \geq 0$ 16

3. What is duality in Linear Programming Problem ? Apply the principle of duality to solve the following L.P.P. :

Maximize $z = 3x_1 - 2x_2$

Subject to the constraints :

$x_1 + x_2 \leq 5$

$x_2 \leq 4$

$1 \leq x_2 \leq 6$

$x_1, x_2 \geq 0$ 16

UNIT—II

4. (a) The New telephone company is developing plans to connect six towns with underground cable in order that the towns can communicate with each other. The matrix of distances between towns is given below. Determine the cable connections that will result in minimal total length.

From Town ↓	→ To Town					
	A	B	C	D	E	F
A	—	10	9	30	27	20
B	10	—	15	18	17	20
C	9	15	—	25	21	16
D	30	18	25	—	8	17
E	27	17	21	8	—	13
F	20	20	16	17	13	—

(b) Explain how the assignment problem can be treated as a particular case of transportation problem. 12,4

5. What do you understand by traveling salesman problem ? What problem do you envisage in finding solution to such problems by usual Hungarian Assignment algorithm ? Explain branch and bound method to find the solution to traveling salesman problem. Explain by taking suitable example. 16

UNIT—III

6. (a) What is a project ? Give two examples.

   (b) The project of constructing a small bridge in Chandigarh consists of 10 major activities. Information pertaining to the projects is given below :

Activity	Optimistic (a)	Most Likely (m)	Pessimistic (b)
A	2	5	8
B	4	7	10
C	4	9	14
D	6	10	20
E	1	3	5
F	3	6	9
G	4	5	12
H	6	8	10

   Develop a PERT network for this project and find the critical path. Compute the probability of completing the project in 29 weeks. 4,12

7. What are the five criteria for making decisions under uncertainty and risk ? What is Bayesian analysis in decision theory ? What is its purpose ? Explain with examples. 16

UNIT—IV

8. A computer shop has a laser printer. The jobs for laser printing are randomly distributed approximating a Poisson

distribution with mean service rate of 10 jobs per hour, since job pages vary in length (pages to be printed). The jobs arrive at a rate of 6 per hour during the entire 8 hours workday. If the laser printer is valued Rs. 30/- per hour, determine :

(a) The percent time an arriving job has to wait

(b) Average system time

(c) Average idle time cost of the printer per day. 16

9. What is simulation ? Indicate the reasons for using it. What are its applications and phases ? Explain various types of simulation models with examples. Define the technique of Monte Carlo Simulation. 16

10. (a) Determine the optimal pure strategy, if exists :

		Player B			
		1	2	3	4
Player A	1	0	7	5	12
	2	10	11	9	13
	3	9	5	7	2

(b) Solve the following game graphically :

		Player B			
		1	2	3	4
Player A	1	4	3	2	0
	2	3	2	5	4

8,8