

END OF SEMESTER EXAMINATIONS, NOVEMBER - 2017

OPERATIONS RESEARCH

SUBJECT CODE : 17P3MA07

MAJOR : M.Sc (MATHEMATICS)

SEMESTER : I

TIME : 3 HOURS

MAX. MARKS: 70

SECTION A - (5 X 4 = 20)Answer All the Questions:

1. Determine the following two-person zero-sum games are strictly determinable and fair.

$$\begin{matrix} & \text{player B} \\ \text{player A} & \begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix} \end{matrix}$$

[OR]

2. For the game with the following pay-off matrix determine the optimal strategies and the value of the game.

$$\begin{matrix} & p_2 \\ p_1 & \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$$

3. Write Wolfe's Algorithm for Quadratic programming problem.

[OR]

4. Find the optimum integer solution to the following All Integer programming problem.

$$\text{Maximize } Z = x_1 + 2x_2$$

Subject to the constraints,

$$x_1 + x_2 \leq 7$$

$$2x_1 \leq 11$$

$$2x_2 \leq 7$$

$$x_1, x_2 \geq 0 \text{ and are integers}$$

5. Explain the characteristics of Dynamic programming.

[OR]

6. Use dynamic programming to solve the following problem.

$$\text{Minimize } Z = y_1^2 + y_2^2 + y_3^2$$

Subject to the constraints

$$y_1 + y_2 + y_3 \geq 15$$

$$y_1, y_2, y_3 \geq 0$$

7. Explain the characteristics of Queuing system.

[OR]

8. A T.V repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately poisson with an average rate of 10 per 8 hour day, what is repairman's expected ideal time each day? How many jobs are ahead of the average set just brought in?

9. Explain the different types of failures in replacement theory.

[OR]

10. A machine cost Rs. 10,000. Its operating cost and resale values are given below.

Year	1	2	3	4	5	6	7	8
Operating cost	1000	1200	1400	1700	2000	2500	3000	3500
Resale value	6000	4000	3200	2600	2500	2400	2000	1600

Determine at what time it could be replaced.

SECTION B - (5 X 10 = 50)Answer All the Questions:

11. Solve the following 2x3 game graphically:

$$\begin{matrix} & \text{player B} \\ \text{player A} & \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix} \end{matrix}$$

[OR]

...2...

12. Use dominance property to solve the following game.

	B_1	B_2	B_3	B_4	B_5
A_1	4	4	2	-4	-6
A_2	8	6	8	-4	0
A_3	10	2	4	0	12

13. Use Wolfe's method to solve the Q.P.P.

$$\text{Maximize } Z = 2x_1 + 3x_2 - 2x_1^2$$

Subject to the constraints

$$x_1 + 4x_2 \leq 4$$

$$x_1 + x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

[OR]

14. Solve the following mixed integer programming problem.

$$\text{Maximize } Z = 4x_1 + 6x_2 + 2x_3$$

Subject to the constraints

$$4x_1 - 4x_2 \leq 5$$

$$-x_1 + 6x_2 \leq 5$$

$$-x_1 + x_2 + x_3 \leq 5$$

$$x_1, x_2, x_3 \geq 0; x_1 \text{ and } x_3 \text{ are integers.}$$

15. Divide a positive quantity 'c' into 'n' parts in such a way that their products is a maximum.

[OR]

16. In 18th century, when transportation systems were not developed, a family wanted to travel home to reach a friend's house in other part of the country. But they had a choice of various routes and haltages in between from their home to final destination. Cost of travel from each point to the other points en route based on relevant factors such as distance, difficulties, mode of available transportation etc are given below.

		5	6	7		8	9		10
	2	3	4		2	8	3	9	
1	7	5	4		3	10	7	6	
					4	4	5	6	
						4	6	8	
						6	7	4	8
						7	3	6	9
									5
									4

Find the most safest route of travelling so that the total travelling cost becomes minimum.

17. Explain $(M|M|1):(\alpha|FIFO)$.

[OR]

18. Problems arrive at a computing centre in a poisson fashion at an average rate of five per day. The rules of the computing centre are that any man waiting to get his problems solved must aid the man whose problem is being solved. If the time to solve a problem with one man has an exponential distribution with mean time of $\frac{1}{5}$ day and if the average solving time is inversely proportional to the number of people working on the problem, find the expected time in the centre for a person entering the line.

19. A firm is considering replacement of a machine whose cost price is Rs. 12,200 and the scrap value Rs. 200. The running cost in Rupees are found from experience to be as follows:

Year	1	2	3	4	5	6	7	8
Running cost	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

[OR]

20. The following mortality rates have been observed for a certain type of light bulbs.

Week	1	2	3	4	5
Percent failing by the end of week	10	25	50	80	100

There are 1000 bulbs in use and it cost Rs.2 to replace an individual bulb which has burnt out. If all the bulbs were replaced simultaneously it would cost 50 paise per bulb. It is proposed to replace all bulbs at fixed intervals whether or not they have burnt out and to continue replacing burnt out bulbs as they fail. At what intervals should all the bulbs be replaced.
