B.Sc. DEGREE EXAMINATION,APRIL 2019
II Year IV Semester
Operations Research - I

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. What is Operations Research?
2. Write the Dual of the following LPP.

   Maximize z = $3x_1 + 4x_2$

   Subject to the constraints

   $4x_1 + 2x_2 \leq 80$,

   $2x_1 + 5x_2 \leq 180$,

   $x_1 \geq 0$, $x_2 \geq 0$
3. What is meant by opportunity loss?
4. A businessman has three alternatives open to him, each of which can be followed by any of the four possible events. The conditional payoffs (in Rs.) for each action-event combination are given below:

Alternative	Payoffs conditional on events			
	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
Z	14	6	0	8

   Determine which alternative the businessman should choose, if he adopts the maximin criterion.
5. Define Expected value of Perfect Information(EVPI).
6. What is a decision tree?
7. Find the value of the game for the following payoff matrix:

	B_1	B_2
A_1	0	2
A_2	-1	4

8. Define a two person zero sum game.
9. In a factory, there are six jobs to perform, each of which should go through two machines A and B in the order A, B. The processing timings (in hours) for the jobs are given below. Determine the sequence of jobs?

Job	J_1	J_2	J_3	J_4	J_5	J_6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

10. What is total elapsed time?
11. Define the term mixed strategy.
12. Define the slack and surplus variables.

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. A firm manufactures headache pills in two sizes A and B. Size A contains 2 grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine. Size B contains 1 grain of aspirin, 8 grains of bicarbonate and 6 grains of codeine. It is found by users that it requires at least 12 grains of aspirin, 74 grains of bicarbonate and 24 grains of codeine for providing immediate effect. It is required to determine the least number of pills a patient should take to get immediate relief. Formulate the problem as a LPP.
14. Indicate the difference between decision under risk and decision under uncertainty in decision theory.
15. Discuss the advantages of decision tree analysis.
16. Solve the following 2 X 2 game graphically:

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	2	1	0	-2
A_2	1	0	3	2

17. Use graphical method to minimize the time added to process the following jobs on the machines shown, i.e., for each machine find the job which should be done first. Also calculate the total time elapsed to complete both the jobs.

Job 1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job 2	Sequence	B	C	A	D	E
	Time	5	4	3	2	6

18. Use the graphical method to solve the following LPP:

    Maximize $z = 2x_1 + 3x_2$

    Subject to the constraints

    $x_1 + x_2 \leq 30$,

    $x_1 - x_2 \geq 0$,

$x_2 \geq 3$,

$0 \leq x_1 \leq 20$ and $0 \leq x_2 \leq 12$.

19. Explain the method of finding optimal solution of two-person zero-sum games.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Use simplex method to

Minimize $z = x_2 - 3x_3 + 2x_5$

Subject to the constraints

$3x_2 - x_3 + 2x_5 \leq 7$

$-2x_2 + 4x_3 \leq 12$

$-4x_2 + 3x_3 + 8x_5 \leq 10$

$x_2 \geq 0$, $x_3 \geq 0$ and $x_5 \geq 0$.

21. Write short notes on:

(i) Laplace Criterion

(ii) Savage criterion

(iii) Hurwicz Criterion

22. A company manufactures goods for a market in which the technology of the products is changing rapidly. The research and development department produced a new product which appears to have potential for commercial exploitation. A further Rs. 60,000 is required for development testing. As a result of previous experience of this type of market, it has been possible to derive a probability distribution relating to the proportions of customers who will buy the product, as follows:

Proportion of Customers	0.04	0.08	0.12	0.16	0.20
Probability	0.1	0.1	0.2	0.4	0.2

Determine the expected opportunity losses, given no other information than that stated above, and state whether or not the company should develop the product.

23. Solve the following game:

	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

24. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information. Processing time on machines is given in hours and passing is not allowed.

Job	A	B	C	D	E	F	G
Machine M_1	3	8	7	4	9	8	7
Machine M_2	4	3	2	5	1	4	3
Machine M_3	6	7	5	11	5	6	12