B.Sc. DEGREE EXAMINATION,NOVEMBER 2019
III Year VI Semester
Operations Research

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define Feasible solution
2. Give a Limitation of LPP?
3. Define Surplus Variable.
4. Write the canonical form of LPP in matrix form.
5. State the necessary and sufficient condition for a transportation problem to have feasible solution.
6. Define an Assignment Problem.
7. Five jobs are to be processed on two machines M_1 and M_2 in the order M_1M_2. The processing times (in hours) are as follows:

Job :	1	2	3	4	5
Machine M1 :	5	4	8	7	6
Machine M2 :	3	9	2	4	10

   Determine the optimum sequence.
8. What is a sequencing problem.
9. What are the three time estimates involved in PERT analysis?
10. Define Activity.
11. What is degeneracy in a Transportation problem?
12. Define Total Elapsed Time.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Solve by Graphical method Maximize $Z = 2x_1 + 3x_2$.

    Subject to the constraints,

    $x_1 + x_2 \geq 4$

    $x_1 - x_2 \leq 2$

    $x_1, x_2 \geq 0$

14. Solve the LPP by using Simplex method

    Maximize $Z = 4x_1 + 10x_2$.

    Subject to the constraints,

    $2x_1 + x_2 \leq 50$

    $2x_1 + 5x_2 \leq 100$

    $2x_1 + 3x_2 \leq 90$

    $x_1, x_2 \geq 0$

15. Find the non-degenerate basic feasible solution for the following Transportation problem using Least Cost Entry method.

	Destination				
					Supply
Source	10	20	5	7	10
	13	9	12	8	20
	4	5	7	9	30
	14	7	1	0	40
	3	12	5	19	50
Demands	60	60	20	10	150

16. Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines M1 and M2 in the order M1$\rightarrow$ M2.

Job :	A	B	C	D	E	F	G	H	I
Machine 1 :	2	5	4	9	6	8	7	5	4
Machine 2 :	6	8	7	4	3	9	3	8	10

17. The Following table gives the activities in a project.

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration	8	7	12	4	10	3	5	10	7	4

    (i)Draw the network for the project

    (ii) Find the critical path

18. A manufacturer makes two products P_1 and P_2 using two machines M_1 and M_2. Product P_1requires 2 hours on machine M_1 and 6 hours on machine M_2. Product P_2 requires 5 hours on machine M_1 and no time on machine M_2. There are 16 hours of time per day available on machine M_1 and 30 hours on M_2. Profit margin from P_1 and $P_2$are Rs.2 and Rs.10 per unit respectively. What should be the daily production mix to optimize profit. Formulate the LPP.

19. Solve the assignment problem for maximization. Given the profit matrix (in Rs.)

		Machines			
		P	Q	R	S
JOB	A	51	53	54	50
	B	47	50	48	50
	C	49	50	60	61
	D	63	64	60	60

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

Answer any **THREE** questions

20. Solve the following LPP by Graphical method.

    Maximize $Z = 100x_1 + 40x_2$.

    Subject to the constraints,

    $5x_1 + 2x_2 \leq 1000$

    $3\ x_1 + 2\ x_2 \leq 900$

    $x_1 + 2x_2 \leq 500$

    $x_1, x_2 \geq 0$.

21. Solve the following L.P.P by simplex method.

    Maximize $Z = 300x_1 + 200\ x_2$

    Subject to the constraints,

    $5x_1 + 2\ x_2 \leq 180$

    $3\ x_1 + 3\ x_2 \leq 135$

    $x_1, x_2 \geq 0$.

22. Solve the following Transportation problem.

		Destination				
		A	B	C	D	Supply
Source	1	11	20	7	8	50
	2	21	16	20	12	40
	3	8	12	18	9	70
	Demand	30	25	35	40	

23. Solve the following sequencing problem of 4 jobs on 6 machines.

	Machines					
Job	M1	M2	M3	M4	M5	M6
A	19	8	8	3	11	24
B	18	6	9	6	9	18
C	12	5	8	5	7	15
D	20	5	3	4	8	11

24. Draw the following network. What is the probability that the project will be Completed in 27 days?

Activity	1-2	2-3	1-4	2-5	2-6	3-6	4-7	5-7	6-7
T_o	3	2	6	2	5	3	3	1	2
T_m	6	5	12	5	11	6	9	4	5
T_p	15	14	30	8	17	15	27	7	8