B.Sc DEGREE EXAMINATION,APRIL 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. State the limitations of graphical method of solving a LPP?
3. Define Slack Variable.
4. What is the purpose of an artificial variable?
5. Define an Assignment Problem.
6. What is an unbalanced transportation problem?
7. Define a) Total Elapsed Time b) Idle time
8. Five jobs are to be processed on two machines M1 and M2 in the order M1M2. The processing times(in hours) are as follows:

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

   Determine the optimum sequence.
9. Expand i) CPM and ii) PERT
10. What are the three time estimates involved in PERT analysis?
11. Mention two methods of finding initial basic feasible solution to a Transportation problem.
12. What is a dummy activity?

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

Answer any **FIVE** questions

13. Solve by Graphical method Maximize $Z = 3x_1 + 4x_2$.

    Subject to the constraints,

    $x_1 + x_2 \leq 450$

    $2x_1 + x_2 \leq 600$

    $x_1, x_2 \geq 0$

14. Solve the LPP using Simplex method

    Maximize $Z = 21x_1 + 15x_2$.

    Subject to the constraints,

    $-x_1 - 2x_2 \geq -6$

    $4x_1 + 3x_2 \leq 12$

    $x_1, x_2 \geq 0$

15. A project work consists of four major jobs for which four major contractors have submitted tenders. The tender documents quoted in thousands of rupees are given in the matrix as below. Find the assignment which minimizes the total project cost. Each contractor has to be assigned one job.

		Jobs			
		J1	J2	J3	J4
	C1	15	27	35	20
Contractors	C2	21	29	33	17
	C3	17	25	37	15
	C4	14	31	39	21

16. We have five jobs, each of which must go through machines A, B, C in the order ABC. Processing times are given in the following table. Find the optimum sequence, the total minimum elapsed time and idle time for each machine.

Jobs :	1	2	3	4	5
Machine A :	8	10	6	7	11
Machine B :	5	6	2	3	4
Machine C :	4	9	8	6	5

17. The following are the characteristics of a project. Draw the network diagram and find the critical path.

Activity :	A	B	C	D	E	F	G	H
Immediate Predecessors:	-	-	B	A,C	A,C	D	E	F,G
Duration in days :	10	5	3	4	6	6	5	5

18. Find an initial basic feasible solution using least cost entry method.

	A	B	C	D	E	Supply
X	4	1	2	6	9	100
Y	6	4	3	5	7	120
Z	5	2	6	4	8	120
Demand	40	50	70	90	90	

19. What are the Limitations of LPP?

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

Answer any **THREE** questions

20. 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? Solve by Graphical method.

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

    Maximize $Z = 45x_1 + 80x_2$

    Subject to the constraints,

    $5x_1 + 20\ x_2 \leq 400$

    $10\ x_1 + 15\ x_2 \leq 450$

    and $x_1, x_2 \geq 0$.

22. Solve the following transportation problem

					Availability
	10	18	11	7	20
	9	12	14	6	40
	8	9	12	10	35
Requirement	16	18	31	30	95

23. Compute the minimum total elapsed time needed to process jobs 1 and 2 on five machines M_1, M_2, M_3, M_4, M_5 given the following data:

Job 1 Sequence	M_1	M_2	M_3	M_4	M_5
Time (hrs)	2	3	4	6	2
Job 2 Sequence	M_3	M_1	M_4	M_5	M_2
Time (hrs)	4	5	3	2	6

24. A project has the following characteristic.

    (i) Construct the Network.

    (ii)Find total float for each activity

    (iii) the critical path and the project duration.

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time(days)	4	1	1	1	6	5	4	8	1	2	5	7