B.Sc. DEGREE EXAMINATION,NOVEMBER 2019
III Year V Semester
Operations Research - II

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

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

Answer any **TEN** questions

1. Write basic duality theorem.
2. Mention the advantages of duality in LP.
3. Write the mathematical form of transportation model.
4. When is the transportation problem unbalanced?
5. When is the solution degenerate in transportation problem?
6. Define Assignment problem.
7. How is the assignment problem a special case of transportation problem?
8. What is meant by network scheduling?
9. Distinguish between CPM and PERT.
10. Define an activity.
11. What are the types of replacement problem?
12. What is the theory of replacement?

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

Answer any **FIVE** questions

13. Find the dual of the following LPP

    Min $Z = 3x_1 – 2x_2 + 4x_3$

    subject to the constraints

    $3x_1 + 5x_2 + 4x_3 \geq 7$;

    $6x_1 + x_2 + 3x_3 \geq 4$;

    $7x_1 - 2x_2 - x_3 \leq 10$;

    $x_1 - 2x_2 + 5x_3 \geq 3$;

    $4x_1 + 7x_2 - 2x_3 \geq 2$;

    $x_1, x_2, x_3 \geq 0$

14. Determine an initial feasible solution to the following transportation problem using least cost method

	Destination				
Factories	D1	D2	D3	D4	Supply
F1	1	2	1	4	20
F	3	3	2	1	23
F3	4	2	5	9	37
F4	3	1	7	3	20
Demand	20	40	30	10	

15. Find the optimum solution to the following assignment problem

		Job		
		X	Y	Z
	A	18	17	16
Workers	B	15	13	14
	C	19	20	21

16. Given the following information develop a network.

Activity	A	B	C	D	E	F	G	H
Preceding Activity	-	-	-	A	C	B,E	C	G,F

17. The cost of the machine is Rs.6,100 and its scrap value is Rs.100. The maintenance cost found from the experience are as follows:

Year	1	2	3	4	5	6	7	8
Maintenance Cost(in Rs.)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

18. Explain Hungarian method of solving assignment problem.
19. Explain the general rules for constructing dual from the primal problem.

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

Answer any **THREE** questions

20. Solve using dual simplex method

Min Z = 2X + 2Y subject to the constraints

$2X + 4Y \geq 1$; $X + 2Y \geq 1$; $2X + Y \geq 1$; $X, Y \geq 0$.

21. Find the Optimal solution for the following transportation Problem

		Destination				
		D1	D2	D3	D4	Supply
	O1	3	2	1	3	6
Origin	O2	0	8	6	5	7
	O3	4	3	2	1	10
	Demand	4	5	6	8	

22. For the following information draw the network diagram and find the critical path. Find the Total, Independent and Free floating times:

Activity	1-2	1-4	2-3	3-5	3-8	4-8	5-6	5-8
Duration	4	36	2	15	10	2	4	9

Activity	6-7	7-8	7-9	8-9	9-10
Duration	9	9	8	20	20

23. Find the optimal travelling cost of salesman visiting five places:

	A	B	C	D	E
A	∞	4	7	3	4
B	4	∞	6	3	4
C	7	6	∞	7	5
D	3	3	7	∞	7
E	4	5	5	7	∞

24. Fleet cars have increased their costs as they continue in service due to increased direct operating costs (gas and oil)and increased maintenance (repairs, batteries etc). The initial cost is Rs.3800 and the trade-in value drops as time passes until it reaches a constant value of Rs.600. given the cost of operating , maintaining and the trade-in value, determine the proper length of service before cars should be replaced.

Years of service	1	2	3	4	5
Year end trade in value	2000	1200	800	700	600
Annual operating Cost	1600	1900	2200	2500	2800
Annual Maintenance cost	400	500	700	900	1100