(Pages : 4) **K – 1009**

Reg. No. : .....

Name : .....

Third Semester B.B.A.LL.B Degree (Five Year Integrated) Examination, October 2020

Paper III : OPERATIONS RESEARCH

Time : 3 Hours Max. Marks : 80

I. Answer **any five** of the following. Each carries **2** marks.

1. Define operations research.
2. Give an example for triangular matrix.
3. What do you mean by unbounded solution?
4. What is dummy activity?
5. State the meaning of zero sum game.
6. List the methods to find out initial feasible solution of transportation problem.
7. What is saddle point?
8. What is a square matrix?

(5 × 2 = 10 Marks)

II. Answer **any four** of the following. Each carries **4** marks.

9. Explain the scope of OR in production management.
10. Describe the basic assumptions in LPP.

P.T.O.

11. Find the values of x and y from the following equation

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

12. Differentiate between PERT and CPM.

13. State the assumptions for two person zero sum game.

14. State the relevance of transportation problem. **(4 × 4 = 16 Marks)**

III. Answer **any four** of the following. Each carries **6** marks.

15. Explain the managerial applications of theory of games.

16. Solve the following assignment problem.

	A	B	C	D	E
1	6	5	8	11	16
2	1	13	16	1	10
3	16	11	8	8	8
4	9	14	12	10	16
5	10	13	11	8	16

17. There are nine jobs. each of which must go through two machines P and Q in the order PQ, the processing in a times (in hours) are given below:

Machine	Job(s)								
	A	B	C	D	E	F	G	H	I
P	2	5	4	9	6	8	7	5	4
Q	6	8	7	4	3	9	3	8	11

Find the sequence that minimizes the total elapsed time T. Also calculate the total idle time for the machines in this period.

18. A Machine owner finds from his past records that the maintenance costs per year of a machine whose purchase price is Rs.8,000 are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance Cost :	1000	1300	1700	2200	2900	3800	4800	6000
Resale Price :	4000	2000	1200	600	500	400	400	400

Determine at which time it is profitable to replace the machine.

19. Explain the techniques of Operations Research.

20. Distinguish between Transportation and Assignment.

(4 × 6 = 24 Marks)

IV. Answer **any three** of the following. Each carries **10** marks.

21. If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ then verify that $A(adj\ A) = |A|I$. Also find A^{-1}.

22. A firm plans to purchase at least 200 quintals of scrap containing high quality metal X and low quality metal Y. it decides that the scrap to he purchased must contain at least 100 quintals of X metal and not more than 35 quintals of Y metal. The firm can purchase the scrap from two suppliers (A and B) in unlimited quantities. The percentage of X and Y metals in terms of weight in the scrap supplied by A and B is given below:

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

The price of A's scrap is Rs 200/Quintal and that of B's is Rs.400/Quintal. The firm wants to determine the quantities that it should buy form two suppliers so that the total cost is minimized. Solve the problem through the graphic method of LPP.

23. Solve the following transportation problem.

	X	Y	Z	
A	10	9	8	8
B	10	7	10	7
C	11	9	7	9
D	12	14	10	4
	10	10	8	28

24. Construct the network for the project whose activities and the tree time estimates of these activities (in days) are given below, Draw the network and find the critical path.

Activity	1-2	1-3	1-4	2-4	2-5	3-4	4-5
t_o	2	3	4	8	6	2	2
t_m	4	4	5	9	8	3	5
t_p	5	6	6	11	12	4	7

25. Explain the terms :

(a) Key row

(b) Key column

(c) Key element

(d) Replacement ratio

(e) Degeneracy in LPP.

(3 × 10 = 30 Marks)