MAJOR : B.B.A.
TIME : 3 HOURS

SEMESTER : V
MAX. MARKS: 75

SECTION – A (10 x 1 = 10)

Answer ALL the Questions:

1. Mention any two limitations of operations research.
2. Expand LPP.
3. Define balanced transportation problem.
4. What is assignment problem?
5. Define pure birth model.
6. What is optimum strategy?
7. Expand CPM.
8. Define network.
9. Expand PERT.
10. What do you understand by predecessor activity?

SECTION – B(5 x 4 = 20)

Answer any FIVE Questions:

11. An electronic company is engaged in the production of two components C_1 and C_2 used in T.V. sets. Each unit of C_1 costs the company Rs. 25 in wages and Rs. 25 in material, while each unit of C_2 costs the company Rs. 125 in wages and Rs. 75 in material. The company sells both products on one – period credit terms, but the company's labour and material expenses must be paid in cash. The selling price of C_1 is Rs. 150 per unit and of C_2 is Rs. 350 per unit. Because of the strong monopoly of the company for these components, it is assumed that the company can sell at the prevailing prices as many units as it produces. The company's production capacity is however, limited by two considerations. First, at the beginning of period 1, the company has an initial balance of Rs. 20,000 (cash plus bank credit plus collections from past credit sales). Second, the company has available in each period 4,000 hours of machine time and 2,800 hours of assembly time. The production of each C_1 requires 6 hours of machine time and 4 hours of assembly time, whereas the production of each C_2 requires 4 hours of machine time and 6 hours of assembly time. Formulate his problem as an linear programming model so as to maximize the total profit to the company.

12. Explain the applications of operations research.

13. Find an initial basic feasible solution to the following transportation problem using the least cost method.

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

Where O_i and D_j denote i^{th} origin and j^{th} destination respectively.

..2..

14. Solve the assignment problem.

Task	Men		
	1	2	3
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

15. For the game with the following payoff matrix, determine the optimum strategies and the value of the game.

$$P_1 \begin{matrix} & P_2 \\ \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$$

16. Draw a network diagram for the following data.

Activity : A B C D E F G H I J
Preceding Activities : None A A B A B,E C D,F G H,I

17. List out the rules of network construction.

18. Obtain an initial basic feasible solution to the following transportation problem using the north – west corner rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

SECTION – C (3 x 15 = 45)

Answer any THREE Questions:

19. Solve the LPP by Graphical method, Maximize $Z = 4x_1 + 3x_2$ subject to the constraints

$$2x_1 + x_2 \leq 1,000$$
$$x_1 + x_2 \leq 800$$
$$x_1 \leq 400 \text{ and } x_2 \leq 700$$
$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

20. Find the initial basic feasible solution to the following transportation problem using Vogel's approximation method given the cost matrix.

	D_1	D_2	D_3	D_4	Supply
S_1	20	25	28	31	200
S_2	32	28	32	41	180
S_3	18	35	24	32	110
Demand	150	40	180	170	

..3..

21. A Super market has a single cashier. During the peak hours, customers arrive at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Calculate:
   a. Probability that the cashier is idle
   b. Average number of customers in the queuing system
   c. Queue size
   d. Average time a customer spends in the system
   e. Average time a customer spends in the queue waiting for service

22. A small project consists of seven activities for which the relevant data are given below.

Activity	Preceding Activities	Activity Duration (Days)
A	–	4
B	–	7
C	–	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

   i. Draw the network and find the project completion time.
   ii. Calculate total float for each of the activities and highlight the critical path.

23. A Project consists of eight activities with the following relevant information.

Activity	Immediate Predecessor	Estimated Duration (Days)		
		Optimistic	Most likely	Pessimistic
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

   a. Draw the PERT network and find out the expected project completion time.

   b. What duration will have 95% confidence for project completion?

   c. If the average duration for activity F increases to 14 days, what will be its effect on the expected project completion time which will have 95% confidence?

   (for standard normal z=1.645, and under the standard normal curve from 0 to z is 0.45)

* * * * *