OPERATIONS RESEARCH

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)
Answer ALL questions

ALL questions carry EQUAL marks   (10 x 2 = 20)

1   Define the net evolution.
2   Write the primal form and dual form of an L.P.P.
3   Portray the transportation problem in a tabular form.
4   Define triangular basis.
5   Define a saddle point.
6   State the general rules of dominance.
7   Define total float.
8   Define t_m.
9   State the characteristic of Queueing system.
10 Write the symbolic form of queueing model and explain.

SECTION - B (25 Marks)
Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

11 a   Define the following :
(i) General linear programming problem   (ii) Objective function.

OR

b   Obtain the dual problem of the following L.P.P.

Max : $f(x) = 2x_1 + 5x_2 + 6x_3$

S.to $5x_1 + 6x_2 - x_3 \leq 3,$

$-2x_1 + x_2 + 4x_2 \leq 4,$

$x_1 - 5x_2 + 3x_3 \leq 1,$

$-x_1 - 3x_2 + 7x_3 \leq 6, x_1, x_2, x_3 \geq 0.$

12 a   Using north – west corner rule obtain an initial basic feasible solution to the following transportation problem.

	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	

OR

b   A department head has four task, to be performed and three subordinates, the subordinates differ in efficiency. It is given in the following matrix. How should he allocate the tasks one to each man so as to minimize the total man hours?

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

13 a   Write the rules of network constructions.

OR

b   Write the iterative procedure of determining critical path.

Cont ...

14 a State prove the existence of saddle point.

OR

b For the game with the following pay-off matrix determine the optimum strategies and the value of the game.

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

15 a A T.V repairman finds that the time spent on his jobs have an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 – hr / day, what is repairman's expected idle time each day? How many jobs are ahead if the average set just brought in ?

OR

b Explain the distribution of inter-arrival times in exponential process.

SECTION - C (30 Marks)
Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Use duality to solve the following L.P.P.

Maximize $Z = 2x_1 + x_2$ s. to

$$x_1 + 2x_2 \le 10, \quad x_1 - x_2 \le 2$$
$$x_1 + x_2 \le 6, \quad x_1 - 2x_2 \le 1, \quad x_1, x_2 \ge 0, x_1, x_2 \ge 0.$$

17 A company has three plants at location A, B and C, which supply to warehouse located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in rupees) are given below.

		To			
	D	E	F	G	H
A	5	8	6	6	3
From B	4	7	7	6	5
C	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation cost.

18 Determine the solution of the following 2 x 3 game graphically:

$$\text{Player A} \begin{matrix} \text{Player B} \\ \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix} \end{matrix}.$$

19

	1-2	1-3	1-4	2-5	2-6	3-6	3-7	4-7	5-8	6-8	7-8
a	7	10	5	50	30	50	1	40	5	20	30
b	17	60	15	110	50	90	9	68	15	52	50
m	9	20	10	65	40	55	5	48	10	27	40

a) Draw the network
b) Calculate slack for each node
c) Determine critical path
d) What is the probability of completing it in 125 days?

20 Assume that the goods trains are coming in a yard at the rate of 30 trains per day and suppose that the inter – arrival times follow an exponential distribution. The service time for each train is assumed to be exponential with an average of 36 minutes. If the yard can admit 9 trains at a time (there being 10 lines, one of which is reserved for shutting purposes), calculate the probability that the yard is empty and find the average queue length.