

MBA
Second Semester
Operations Research
(MBA- 15)

Duration: 3Hrs.

Full Marks: 70

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer any five questions

5x2=10

- a. Why OR is called Inter- disciplinary team approach?
- b. Explain the term linearity in relation to LP problem.
- c. What is unbalanced Assignment Model?
- d. What do you mean by basic feasible solution in transportation problem?
- e. Is it possible to obtain more than one optimal allocations in a transportation problem? Give a very short answer.
- f. State four objective of the network analysis.
- g. Explain the term "Float".

2. Answer any four questions.

4x3 = 12

- a. Distinguish between Slack variable and Surplus variable.
- b. Vitamins A and B are found in two different foods F_1 and F_2 . One unit of Food F_1 contains 2 units of Vitamin A and 5 units of vitamin B. One unit of food F_2 contains 4 units of Vitamin A and 2 units of vitamin B. One unit of food F_1 and F_2 cost Rs. 10 and 12.5 respectively. The minimum daily requirement (for a person) of vitamin A and B is 40 and 50 units respectively. Assuming that anything in excess of daily minimum requirement of vitamin A and B is not harmful. Find out the optimal minimum of food F_1 and F_2 at the minimum cost which meets the daily minimum requirement of vitamin A and B. Formulate this as a linear programming problem.
- c. Write the mathematical formulation of Assignment Problem.
- d. What are the basic assumption of transportation model?
- e. What are the different stages of project management? Explain them briefly.
- f. What do you mean by pure birth and pure death process?

OR

3. Answer the following questions any four:

4x7 = 28

- a. What are the different approaches of OR Methodology? Explain the approaches with the help of diagram.
- b. Solve the following LPP by Simplex Method
 Maximize $Z = 6X_1 + 8X_2$ Profit function
 Subject to $30X_1 + 20X_2 \leq 300$ product constraints
 $8X_1 + 16X_2 \leq 110$ product constraints
 $X_1, X_2 \geq 0$
- c. What do you mean by dummy rows/columns? When it is added in assignment problem?

Solve the following Assignment Problem.

Machines

Operators	A	B	C	D
1	10	5	7	8
2	11	4	9	10
3	8	4	9	7
4	7	5	6	4
5	8	9	7	5

- d. What are the two steps to find the Optimal Solution of the Transportation Problem?

Solve the following Transportation Problem by NWCM.

Market

Plant	A	B	C	Production at Plant
X	11	21	16	14
Y	07	17	13	26
Z	11	23	21	36
Market Requirement	18	28	25	71 / 76

OR

- e. The following table gives the data for the activities of a small project.

Activity	t_0	t_m	t_p
1 - 2	1	1	7
1 - 3	1	4	7
1 - 4	2	2	8
2 - 5	1	1	1
3 - 5	2	5	14
4 - 6	2	5	8
5 - 6	3	6	15

- i. Draw the project network and identify all the paths.
 - ii. Determine the expected project length.
 - iii. What is the probability that the project will be completed no more than 4 weeks later than expected time.
- f. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and service time distribution is also exponential with an average of 36 minutes. Calculate
- i. Expected queue size (line length)
 - ii. Probability that the queue size exceeds 10.

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(The figures in the margin indicate full marks for the questions)

Duration: 20 minutes

Marks – 20

(PART A- Objective)

(Attempt all the questions. One mark for each question. Each question has four alternatives, choose the correct alternative.)

1. Operations Research is a _____ approach to problem solving for executives.
 - a) multi- disciplinary
 - b) scientific
 - c) intuitive
 - d) all of the above
2. For analyzing a problem, decision- makers should normally study
 - a) its qualitative aspects
 - b) its quantitative
 - c) both (a) and (b)
 - d) neither (a) nor (b)
3. Managerials decisions are based on
 - a) an evaluation of quantitative data
 - b) the use of quantitative factors
 - c) numbers produced by formal model
 - d) all of the above
4. A constraints in an LP model restricts
 - a) value of objective function
 - b) value of decision variable
 - c) use of the available resource
 - d) all of the above

OR

5. The distinguishing feature of an LP model is

- a) relationship among all variable is linear
- b) it has single objective function and constraints
- c) value of decision variables is non- negative
- d) all of the above

6. Constraints in an LP model represents

- a) limitations
- b) requirements
- c) balancing limitations and requirements
- d) all of the above

7. The graphical method of LP problem uses

- a) objective function equation
- b) constraint equations
- c) linear equations
- d) all of the above

8. If two constraints do not intersect in the positive quadrant of the graph, then

- a) the problem is in feasible
- b) the solution is unbounded
- c) one of the constraint is redundant
- d) none of the above

9. For maximization LP model, the simplex is terminated when all values

- a) $c_j - z_j \leq 0$
- b) $c_j - z_j \geq 0$
- c) $c_j - z_j = 0$
- d) $z_j \leq 0$

10. For a maximization problem the objective function coefficient for an artificial variable is

- a) + M
- b) - M
- c) zero
- d) None of the above

11. An optimal assignment requires that the maximum number of lines that can be drawn through squares with zero opportunity cost be equal to the number of

- a) rows or columns
- b) rows and columns
- c) rows + columns - 1
- d) none of the above

12. The purpose of dummy row or column in an assignment problem is to

- a) obtain balance between total activities and total resources
- b) prevent a solution from becoming degenerate
- c) provides a means of representing a dummy problem
- d) none of the above

OR

13. If there were n workers and n jobs there would be

- a) $n!$ Solutions
- b) $(n-1)!$ Solutions
- c) $(n!)^n$ solutions
- d) n solutions

14. The initial solution of a transportation can be obtained by applying any known method

However the only condition is that

- a) the solution be optimal
- b) the rim conditions are satisfied
- c) the solution not be degenerate
- d) all of the above

15. The dummy source or destination in a transportation problem is added to

- a) satisfy rim conditions
- b) prevent solution from becoming degenerate
- c) ensure that total cost does not exceed a limit

16. Priority queue discipline may be classified as

- a) finite or infinite
- b) limited and unlimited
- c) pre-emptive or non pre-emptive
- d) none of the above

17. The calling population is assumed to be infinite when

- a) arrivals are independent of each other
- b) capacity of the system is infinite.
- c) service rate is faster than arrival rate
- d) None of the above

18. PERT means

- a) programme evaluation review technique
- b) project evaluation review technique
- c) priority evaluation ranking test
- d) none of these

19. Network models have advantage in terms of project

- a) planning
- b) scheduling
- c) controlling
- d) all of the above

20. If an activity has zero slack, it implies that

- a) it lies on the critical path
- b) it is a dummy activity
- c) the project is progressing well
- d) none of the above
