

MULTIPLE CHOICE QUESTIONS

1. Operations research is the application of _____ methods to arrive at the optimal solutions to the problems.

A. economical C. a and b both

B. **scientific** D. artistic

Ans B

2. Feasible solution satisfies _____
- A. Only constraints
B. only non-negative restriction
C. **[a] and [b] both**
D. [a],[b] and Optimum solution
- Ans C

3. In Degenerate solution value of objective function_____.
- A. increases infinitely C. basic variables are nonzero
B. decreases infinitely D. **One or more basic variables are zero**
- Ans D

4. Minimize $Z =$ _____
- A. $-\text{maximize}(Z)$ C. $-\text{maximize}(-Z)$
B. $\text{maximize}(-Z)$ D. none of the above

5. In graphical method the restriction on number of constraint is _____.

A. 2
B. 3
C. not more than 3
D. none of the above

6. In graphical representation the bounded region is known as _____ region.

A. Solution C. basic solution
B. **feasible solution** D. optimal

Ans B

7. Graphical optimal value for Z can be obtained from
 A. **Corner points of feasible region** C. Both a and c
 B. corner points of the solution region D. none of the above
 Ans A

8. In LPP the condition to be satisfied is
 A. Constraints have to be linear C. both [a] and [b]
 B. Objective function have to be linear D. none of the above
 Ans C

9. The solution to LPP give below is,

$$\text{Max } Z = 3x_1 + 14x_2 \text{ subject to } x_1 + x_2 \leq 1, x_1 + x_2 \geq 2 \text{ where } x_1, x_2 \geq 0$$
- A. Unbounded solution
 B. Max Z = 14
 C. Max Z = 3
 D. Infeasible solution
- Ans D

10. In sequencing if smallest time for a job belongs to machine-1 then that job has to placed _____ of the sequence.
- A. in the middle
B. at end
C. **in the starting**
D. none of them
- Ans C

10. The solution to LPP give below is _____

$$\text{Max } Z = 30x_1 + 50x_2$$

$$\text{subject to } 2x_1 + 2x_2 \leq 2, 2x_1 + 2x_2 \leq 2 \text{ where } x_1, x_2 \geq 0$$

11. Operation research approach is
 A. **Multi-disciplinary** C. Intuitive
 B. Artificial D. All of the above
 Ans A
12. Operation research analysts do not
 A. **Predict future operation** C. Collect the relevant data
 B. Build more than one model D. Recommend decision and accept
 Ans C

UNIT-II

13. Mathematical model of Linear Programming is important because
 A. **It helps in converting the verbal description and numerical data into mathematical expression**
 B. decision makers prefer to work with formal models
 C. it captures the relevant relationship among decision factors
 D. it enables the use of algebraic techniques
 Ans A
14. A constraint in an LP model restricts
 A. value of the objective function C. use of the available resources
 B. **value of the decision variable** D. all of the above
 Ans B
15. In graphical method of linear programming problem if the iso-cost line coincide with a side of region of basic feasible solutions we get
 A. Unique optimum solution C. no feasible solution
 B. unbounded optimum solution D. **Infinite number of optimum solutions**
 Ans D
16. A feasible solution of LPP
 A. **Must satisfy all the constraints simultaneously**
 B. Need not satisfy all the constraints, only some of them
 C. Must be a corner point of the feasible region
 D. all of the above
 Ans A
17. The objective function for a L.P model is $3x_1 + 2x_2$, if $x_1 = 20$ and $x_2 = 30$, what is the value of the objective function?
 A. 0 C. 60
 B. 50 D. **120**
 Ans D
18. Maximization of objective function in LPP means
 A. Value occurs at allowable set decision
 B. **highest value is chosen among allowable decision**
 C. none of the above
 D. all of the above
 Ans B

19. Alternative solution exist in a linear programming problem when
- A. one of the constraint is redundant
 - B. objective function is parallel to one of the constraints**
 - C. two constraints are parallel
 - D. all of the above

Ans B

20. Linear programming problem involving only two variables can be solved by _____

- A. Big M method
- B. Simplex method
- C. **Graphical method**
- D. none of these

Ans C

21. The linear function of the variables which is to be maximize or minimize is called _____

- A. Constraints
- B. **Objective function**
- C. Decision variable
- D. None of the above

Ans B

UNIT-III

22. A physical model is an example of

- A. **An iconic model**
- B. An analogue model
- C. A verbal model
- D. A mathematical model

Ans A

23. If the value of the objective function z can be increased or decreased indefinitely, such solution is called _____

- A. Bounded solution
- B. **Unbounded solution**
- C. Solution
- D. None of the above

Ans B

24. A model is

- A. An essence of reality
- B. An approximation
- C. An idealization
- D. **All of the above**

Ans D

25. The first step in formulating a linear programming problem is

- A. Identify any upper or lower bound on the decision variables
- B. State the constraints as linear combinations of the decision variables
- C. Understand the problem
- D. **Identify the decision variables**

Ans D

26. The method used for solving an assignment problem is called

- A. reduced matrix method
- B. MODI method
- C. **Hungarian method**
- D. none of the above

27. Dynamic programming is a mathematical technique dealing with the optimization of _____ stage decision process.

- A. multi
- B. single
- C. both A and B
- D. none of them

28. In the simplex method for solving of LPP number of variables can be _____.

- A. Not more than three
- B. at least three
- C. **at least two**
- D. none of them

Ans C

29. In Graphical solution the feasible region is _____.

- a. where all the constraints are satisfied simultaneously.
- b. any one constraint is satisfied.
- c. only the first constraint is satisfied.
- d. any one of the above condition.

Answer: A

30. Transportation problem is said to be unbalanced if _____.

- a. total supply is not equal to total demand.
- b. Total supply is greater than total demand.
- c. total supply is lesser than total demand.
- d. All the above

Answer: D

31. The basic feasible solution to a transportation problem is said to be optimal if it _____.

- a. maximizes or minimizes the transportation cost.
- b. maximizes the transportation cost.
- c. minimizes the transportation cost.
- d. has degenerate solution.

Answer: C

32. The necessary and sufficient condition for the existence of a feasible solution to a transportation problem is a solution that satisfies all the conditions of _____.

- a. supply.
- b. demand.
- c. supply and demand.
- d. either supply or demand.

Answer: C

33. Purpose of MODI method is to get _____.

- a. degenerate solution.
- b. non-degenerate solution.
- c. optimal.
- d. basic feasible solution.

Answer: C

34. In transportation problem the solution is said to be non-degenerate solution if occupied cells is _____.

- a. greater than $m+n-1$.
- b. lesser than $m+n-1$.
- c. greater than or equal to $m+n-1$.
- d. lesser than or equal to $m+n-1$.

Answer: C

35. In a transportation problem, the solution is said to be a degenerate solution if the number of occupied cells is

- a. greater than $m+n-1$.
- b. less than $m+n-1$.
- c. greater than or equal to $m+n-1$.
- d. less than or equal to $m+n-1$.

Answer: B

36. In a transportation problem, if total supply $>$ total demand, we add _____.

- a. dummy row with cost 0.
- b. dummy column with cost 0.
- c. dummy row with cost 1.
- d. dummy column with cost 1.

Answer: B

37. In a transportation problem, if total supply $<$ total demand, we add _____.

- a. dummy row with cost 0.
- b. dummy column with cost 0.
- c. dummy row with cost 1.
- d. dummy column with cost 1.

Answer: A

38. In the North West corner rule, if the demand in the column is satisfied, one must move to the _____.

- a. left cell in the next column.
- b. right cell in the next row.
- c. right cell in the next column.
- d. left cell in the next row.

Answer: C

39. In the North West corner rule, if the supply in the row is satisfied, one must move _____.

- a. down in the next row.
- b. up in the next row.
- c. right cell in the next column.
- d. left cell in the next row.

Answer: A

40. The objective of the transportation problem, which is to be maximized, is to

- a. maximize the total profit.
- b. minimize the total loss.
- c. neither maximize nor minimize.
- d. optimal cost.

Answer: A

41. In Maximization case of transportation problem we convert into minimization by subtracting all the elements from the_____.

- a. zero.
- b. one.
- c. highest element.
- d. lowest element.

Answer: C

42. The application of assignment problems is to obtain_____.

- a. only minimum cost.
- b. only maximum profit.
- c. minimum cost or maximum profit.
- d. assign the jobs.

Answer: D

43. The assignment problem is said to be unbalanced if_____.

- a. number of rows is greater than number of columns.
- b. number of rows is lesser than number of columns.
- c. number of rows is equal to number of columns.
- d. both 1 and 2.

Answer: D

44. The assignment problem is said to be balanced if_____.

- a. number of rows is greater than number of columns.
- b. number of rows is lesser than number of columns.
- c. number of rows is equal to number of columns.
- d. if the entry of row is zero.

Answer: C

45. The assignment problem is said to be balanced if it is_____.

- a. square matrix.
- b. rectangular matrix.
- c. unit matrix.
- d. triangular matrix.

Answer: A

46. In assignment problem if number of rows is greater than column then_____.

- a. dummy column is added .
- b. dummy row added .
- c. row with cost 1 is added.
- d. column with cost 1 is added.

Answer: A

47. In assignment problem if number of column is greater than row then_____.

- a. dummy column is added.
- b. dummy row added .

- c. row with cost 1 is added.
- d. column with cost 1 is added.

Answer: B

48. An LPP has_____.
- a.one optimal solution.
 - b.two optimal solutions.
 - c.Three optimal solutions.
 - d.none of these.

Answer: D

49. An LPP deals with problems involving only_____.
- a.single objective.
 - b.multiple objective.
 - c.two objective.
 - d.none of these.

Answer: A

50. Which of the following is not associated with any LPP?
- a.Feasible Solution.
 - b.Optimum Solution.
 - c.Basic solution.
 - d.Quadratic equation.

Answer: D

51. Which of the following is not true about feasibility?

a.It cannot be determined in a graphical solution of an LPP. b.It is independent of the objective function.
c.It implies that there must be a convex region satisfying all the constraints. d.Extreme points of the convex region give the optimum solution.

Answer: A

52. In Graphical solution the feasible solution is any solution to a LPP which satisfies_____.

- a.only objective function.
- b.on-negativity restriction.
- c.only constraint.
- d.all the three.

Answer: B

53. In Graphical solution the redundant constraint is_____.

- a.which forms the boundary of feasible region.
- b.which do not optimizes the objective function.
- c.which does not form boundary of feasible region.
- d.which optimizes the objective function.

Answer: C

54. Optimal solution in an LPP is_____.

- a.which maximizes or minimizes the objective function.
- b.which maximizes the objective function.
- c.which minimizes the objective function.
- d.which satisfies the non negativity restrictions.

Answer: A

55. Unbounded solution in an LPP is_____.

- a.where the objective function can be decreased indefinitely.
- b.which maximizes the objective function.
- c.where the objective function can be increased or decreased indefinitely.
- d.where the objective function can be increased indefinitely.

Answer: C

56. The two forms of LPP are_____.

- a.standard form and canonical form.
- b.standard form and general form.
- c.matrix form and canonical form.
- d.matrix form and standard form.

Answer: A

57. In the canonical form of LPP if the objective function is of maximization, then all the constraints other than non-negativity conditions are_____.

- a.greater than type.
- b.less than type.
- c.greater than or equal to type.

d. lesser than or equal to type.

Answer: D

58. In the canonical form of LPP if the objective function is of minimization then all the constraints other than non-negativity conditions are_____.

- a. greater than type.
- b. lesser than type.
- c. greater than or equal to type.
- d. lesser than or equal to type.

Answer: C

59. In an LPP the solution for the problems involving more than 2 variables can be solved using_____.

- a. graphical method.
- b. simplex method.
- c. hungarian method.
- d. all the above

Answer: B

60. In the standard form of LPP if the objective functions is of minimization then all the constraints_____.

- a. equations .
- b. inequalities.
- c. greater than or equal to type.
- d. lesser than or equal to type.

Answer: A

61. In the standard form of LPP if the objective function is of minimization then the right hand side of the constraints should be_____.

- a. positive.
- b. negative.
- c. non-negative.
- d. zero.

Answer: C

62. The non-negative variable which is added to LHS of the constraint to convert the inequality $\leq$ into equation is called_____.

- a. random variable.
- b. decision variable.
- c. surplus variable.
- d. slack variable.

Answer: D

63. The non-negative variable which is added to LHS of the constraint to convert the inequality $\geq$ into equation is called_____.

- a. random variable.

- b. decision variable.
- c. surplus variable.
- d. slack variable.

Answer: C

UNIT-IV

64. The test of optimality in simplex method is_____.

- a. $Z_j - C_j \geq 0$.
- b. $Z_j - C_j \leq 0$.
- c. $Z_j - C_j = 0$.
- d. $Z_j - C_j < 0$.

Answer: A

65. The Key column in simplex method is selected when the column of $Z_j - C_j$ is_____.

- a. most negative.
- b. largest negative.
- c. positive.
- d. zero.

Answer: A

66. The Key row is selected when the column of $Z_j - C_j$ is finding the ratio which is_____.

- a. maximum.
- b. minimum.
- c. largest positive.
- d. most negative.

Answer: B

67. In simplex method the LPP has unbounded solution if the variable in the key column is_____.

- a. maximum.
- b. minimum.
- c. positive.
- d. negative.

Answer: D

68. In graphical method the LPP has unbounded solution if the solution space has

- a. no upper boundary.
- b. no lower boundary.
- c. no boundary in the first quadrant.
- d. none of the above.

Answer: A

69. In a linear programming minimization model the objective function is to be_____.

- a. minimized.
- b. maximized.
- c. minimized or maximized.
- d. standardized.

Answer: A

70. Which of the following is associated with any L.P.P?

- a.feasible solution.
- b.optimum solution.
- c.basic solution. d.all the above.

Answer: D

71. Linear programming is_____.

- a.a constraint optimization model.
- b.a constraint decision making model.
- c.a mathematical programming model. d.all the above.

Answer: D

72. Which of the following is not true about feasibility?

- a.it cannot be determined in a graphical solution of an L.P.P. b.it is independent of the objective function.
- c.it implies that there must be a convex region satisfying all the constraints. d.extreme points of the convex region gives the optimum solution.

Answer: A

73. Graphical method can be used only when the decision variables is_____.

- a.more than 3.
- b.more than1. c.two.
- d.one.

Answer: C

74. The region on the graph sheet with satisfies the constraints including the non-negativity restrictions is called the_____space

- a.solution.
- b.interval.
- c.concave.
- d.convex.

Answer: A

75. The_____is the method available for solving an L.P.P.

- a.graphical method.
- b.least cost method.
- c.MODI method .
- d.hungarian method.

Answer: A

76. The graphical method is applicable to solve an L.P.P when there is _____.

- a. Only one variable.
- b. Two variables.
- c. More than two variables
- d. None of the above.

Answer: B

UNIT-V

77. The objective of network analysis is to_____.

- a. Minimize total project duration.
- b. Minimize total project cost.
- c. Minimize product delays, interruption and conflicts
- d. All the above.

Answer: A

78. Network models have advantage in terms of project _____

- a. Planning
- b. Scheduling.
- c. Controlling.
- d. All the above.

Answer: D

79. The slack for an activity is equal to_____

- a. LF-LS.
- b. EF-ES.
- c. LS-ES.
- d. None of the above.

Answer: C

80. The another term commonly used for activity slack time is _____

- a. Total float.
- b. Independent float.
- c. Free float.
- d. All the above.

Answer: D

81. Generally the PERT technique deals with the project of_____

- a. Repetative nature.
- b. Non-repetative nature.
- c. Deterministic nature.
- d. None of the above.

Answer: B

82. In PERT the span of time between the optimistic and pessimistic time estimates of an activity is_____

- a. 3□.
- b. 12□. c. 6□
- d. None of the above.

Answer: B

83. 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.

Answer: A

97. A dummy activity is used in the network diagram when _____

- a. Two parallel activities have the same tail and head events.
- b. The chain of activities may have a common event yet be independent by themselves.
- c. Both a & b
- d. None of the above.

Answer: C

98. While drawing the network diagram for each activity project we should look _____

- a. What activities precede this activity.
- b. What activities follow this activity.
- c. What activity can concurrently take place with this activity.
- d. All the above.

Answer: D

99. In the PERT network each activity time assumes a Beta distribution because _____

- a. It is a unimodal distribution that provides information regarding the uncertainty of time estimates of activities.
- b. It has got finite non-negative error.
- c. It need not be symmetrical about model value.
- d. All the above

Answer: D

100. Float or slack analysis is useful for _____

- a. Projects behind the schedule only.
- b. Projects ahead of the schedule only.
- c. Both a & b.
- d. None of the above.

Answer: A

MATHEMATICAL TECHNIQUE II

K2 QUESTIONS

UNIT-I

1. Define OR? What are the different phases in Operations Research? Describe briefly its applications.
2. Define artificial variable. Why do we need them?
3. Prove that dual of the dual is the primal?
4. Define degeneracy. Narrate the procedure to deal with the problem of degeneracy in transportation?
5. Explain sensitivity analysis and its importance?
6. Explain the graphical method of solving (2 x n) game?
7. What is sequencing problem? State the assumptions of it . Give an example.
8. What are the various types of models available for solving operations research problems?
9. What is a traveling salesman problem?
10. What is renewal theory?
11. Enumerate the main characteristics Operations Research
12. Describe the phases of scientific method in Operations Research.

UNIT-II

13. What is linear programming? What are major limitations and assumptions?
14. What are the advantages of using linear programming?
15. Discuss in brief about replacement policy for the items that deteriorate with time.
16. What are the general steps involved in solution of OR problem.
17. What are the steps to solution of a LP problem by graphical method?
18. Distinguish between a transportation problem and an assignment problem.
19. Briefly explain the reasons for replacement.
20. Describe decision rules for a purchase inventory model with two price break Without shortages.
21. Explain decision variables in a LP problem?
22. Give the properties of a Linear Programming Problem?
23. Define and discuss the scientific method in OR Problem.
24. Explain the role of OR in decision-making.

UNIT-III

25. Why is inventory maintained? Discuss it and give classifications of inventory

26. Give two areas for the application of assignment problem
27. Explain briefly “how the replacement problems are classified”?
28. Define the terms i. Inventory ii. Economic Order Quantity iii. Lead time.
29. Write the Johnson algorithm for solving a sequencing problem.
30. Briefly explain “present worth factor” in Replacement analysis
31. Briefly explain i. pure strategy ii. mixed strategy iii. optimal strategy
32. What is a transportation problem?

UNIT-IV

33. What is a game in the game theory?
34. What is economic production quantity for multiple items?
35. What is variance in relation to activities in PERT?
36. What is duality in LPP? Explain its applications?
37. Explain North-West corner rule.
38. What are the various replacement models?
39. What is economic order interval for single items?
40. What is competitive situation called a game?
41. What are surplus variable?
42. Explain with example ‘North West Corner Rule’
43. Briefly explain the importance of game theory
44. Briefly explain the limitations of game theory.

UNIT-V

45. Differentiate between CPM Network and PERT Network.
46. Explain the term inventory. What are the economics parameter for inventory?
47. What are the stock out costs?
48. Explain unbounded solution?
49. What is crash duration?
50. What is two person zero sum game and also the principle of dominance in the game theory?
51. Explain the basic characteristics of a queue system?
52. Name two applications of traveling sales man problem
53. Derive an expression for economic production quantity with uniform rate of replenishment with no shortages.
54. Distinguish between a balanced and an unbalanced transportation problem.
55. What is the difference between a assignment problem and a traveling salesmen problem?

56. Gives a brief description of the various types of queues
57. What is inventory management?. Briefly, explain the major decisions concern-carrying inventory.
58. Name three methods of finding an initial basic feasible solution to a transportation problem
59. Briefly explain the general rules for dominance
60. Define total elapsed time and idle time on machines as referred to sequencing of Job in machines.
61. Explain briefly: i. Competitive games ii. Zero-sum games iii. Strategy
62. Discuss the impact on Economic Order Quantity if shortages are allowed.
63. Write some important applications of queuing theory.

MATHEMATICAL TECHNIQUE II

K3 QUESTIONS

UNIT-I

1. What do you mean by Operation Research? Define.
2. What are the essential characteristics of Operation Research?
3. Elaborate the classification of OR.
4. Explain the merits in Operation Research.
5. Explain the demerits in Operation Research.

UNIT-II

1. Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order A-B-C as shown in the below table. Also find the total elapsed time.

Machine/Job	1	2	3	4	5	6
A	8	3	7	2	5	1
B	3	4	5	2	1	6
C	8	7	6	9	10	9

2. The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below:

Year	1	2	3	4	5	6	7	8
Maintenance cost in Rs.	900	1200	1600	2100	2800	3700	4700	5900
Resale value in Rs.	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

3. Obtain the optimal strategies for both persons and the value of the game for zero-sum two-person game whose payoff matrix is given below:

3	2	4	0
2	4	4	2
4	2	4	0
0	4	0	8

- 4 explain the types of OR.

5Jobs arrival at a workstation in a manufacturing plant is in a Poisson fashion at an average rate of five per hour. The time to machine one job is an exponential distribution with a mean time of 20 minutes. What is the expected time a job has to wait at the workstation? What will be the average number of jobs waiting at the workstation at anytime? What is the probability that there will be more than four jobs?

UNIT-III

1. Explain how a two person zero-sum game can be solved by linear programming?

2. Write the corresponding rules for primal – dual relations?
3. What is an unbalanced transportation problem. How do you overcome the difficulty?
4. State the mathematical model of an assignment problem?
5. What is transportation? How would you obtain optimal solution to it.
6. 19.What is the unbalanced Assignment problem? How is it solved by the Hungarian method?
7. Find the Total cost using North-west corner method. Also find the optimal assignment.

W1		W2	W3	W4	capacity
F1	95	105	80	15	12
F2	115	180	40	30	7
F3	195	180	95	70	5
Requirement	5	4	4	11	

UNIT-IV

1. Explain the theory of games in the solution of rectangular games?
2. Discuss briefly about various types of replacement problem?
3. What are the functions of inventory classify and discuss various inventory models?
4. State the fundamental property of duality?
5. State and explain the rules for game theory?

UNIT-V

1. Construct PERT network and find the critical path and its duration?
2. What are the time estimates in PERT?
3. What is the basic object of CPM and PERT technique?
4. A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs.50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs.75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find (a) the economic lot size (b) the total optimal cost.
5. Explain decision tree and theories.

MATHEMATICAL TECHNIQUE II

K4 QUESTIONS

UNIT-I

1. What do you mean by Operation Research? Define.
2. What are the essential characteristics of Operation Research?
3. Examine the scope of operations research.
4. Explain the general methods of solving models.
5. Illustrate the merits and the characteristics of OR.
6. Explain the different types of important models used in operation research

UNIT-II

1. Use simplex method to solve lpp

$$\text{Maximize } Z = 4X_1 + 10X_2$$

$$\text{Subject to constraints } 2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90 \text{ and}$$

$$X_1, x_2 \geq 0$$

2. Solve the LPP by Graphical method

$$\text{Maximize } Z = 100x_1 + 40x_2$$

$$\text{Subject to Constraints } 5X_1 + 2x_2 \leq 1000$$

$$3x_1 + 2x_2 \leq 900$$

$$X_1 + 2x_2 \leq 500 \text{ and}$$

$$X_1 + X_2 \geq 0$$

3. Describe simplex method of solving linear programming problems?

4. A person requires 10, 12, and 12 units chemicals A, B, C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per Jar. A dry product contains 1, 2 and 4 units of A, B, C per carton. If the liquid product sells for Rs. 3 per jar and the Dry product sells Rs. 2 per carton, how many of each should be purchased, in order to minimize the cost and requirements?

5. A paper mill produces two grades of paper namely X and Y. Because of Raw material restrictions, it cannot produce more than 400 tons of grade X and 300 tons of grade Y in a week. There are 160 Production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products X and Y respectively, with corresponding profits of Rs. 200 and Rs. 500 per ton. Formulate the LPP to maximize profit and find optimum product mix

6. Solve the following transportation problem using Least Cost Method

	D1	D2	D3	D4	SUPPLY
P1	10	20	5	7	10
P2	13	9	12	8	20
P3	4	5	7	9	30
P4	14	7	1	0	40
P5	3	12	5	19	50
DEMAND	60	60	20	10	

UNIT-III

1. for the game with the following Pay-off matrix, determine the optimum strategy

		PLAYER B	
		B1	B2
PLAYER A	A1	6	-3
	A2	-3	0

2. At one man barber shop customers arriving according to Poisson distribution with mean arrival rate of 5 per hour, and his hair cutting time is exponentially distribution with average hair cut taking to 10 minutes it is assumed that, because of his excellent reputation, customers are willing to wait, so

1. Find average No of customers in the Shop (system)
2. Find average No of customers in the waiting line
3. % of customers who have to wait prior to getting into barber's chair
3. Explain lowest cost entry method for obtaining an initial basic solution of a transportation problem?
4. Explain the method of determining the EOQ with a single price breaks?
5. Explain a general replacement problem?

UNIT-IV

1. Find the Initial Basic Feasible Solution for the following transportation problem using Vogel's approximation method

	D1	D2	D3	D4	SUPPLY
O1	3	7	6	4	5
O2	2	4	3	2	2
O3	4	3	8	5	3
DEMAND	3	3	2	2	

2. Solve the assignment problem

Workers

	A	B	C	D	E
I	10	11	4	2	5
II	7	11	10	14	12
II	5	6	9	12	14
IV	13	15	11	10	7

3.Solve the
using Graphical

game by
Method

		PLAYER B			
		B1	B2	B3	B4
PLAYER A	A1	1	3	-3	7
	A2	2	5	4	-6

4..Data have ben accumulated at a banking facility regarding the waiting time of delivery trucks to be loaded . The data show that the average arrival rate for trucks at the loading clocks (Area port) is per 2 Hour . The average Time to Load a truck is 20 min, find

I. The expected No of trucks in the system

II. The expected No of trucks waiting to serve

III. The expected Waiting time of a truck in the system

IV. The expected Waiting time of truck in the waiting line

V. The probability that a truck has to wait for service.

VI. The Probability that there is no truck in the system

5.. The foolioing table shows the jobs of a project with their duration in days. Draw the

Network diagram and determine the critical path ,also calculate all the floats

job	1-2	1-3	1-4	2-5	3-7	4-6	5-7	5-8	6-7	6-9	7-10	8-10	9-10	10-11	11-12
duraion	10	8	9	8	16	7	7	7	8	5	12	10	15	8	5

UNIT-V

1. Draw the Network diagram for the following
A<D; A<E; B<F; D<F; C<G; C<H; F<I; G<I;
2. Explain the rules of Network connection
3. What are the activity durations in PERT? What is the distribution of the activity duration? Find its mean and variance.

4. Consider the Following Project

Activity	Time Estimates In Weeks			Predecessor
	t_p	t_m	t_p	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

Find the path and standard deviation; also find the probability of completing the project by 18 weeks

(Table Value = $[1.33 = 0.4082][1.4456 = 0.4265][0.8 = 0.7881]$)

5. Explain briefly with example North – West corner rule for transportation problem?

JOBS

OPERATORS

Assign the programmers to the programmes in the compute time is minimum (Assignment

	J1	J2	J3
O1	120	100	80
O2	80	90	100
O3	110	140	120

such a way that Problem)