

QUANTITATIVE TECHNIQUES FOR FINANCE

UNIT 1

1. In graphical representation the bounded region is known as ____ region.
 - A. Solution
 - B. **Feasible solution**
 - C. basic solution
 - D. optimal

2. In Degenerate solution value of objective function _____.
 - A. Increases infinitely
 - B. Decreases infinitely
 - C. basic variables are nonzero
 - D. **One or more basic variables are zero**

3. The linear function of variables which is to be maximized or minimized is called _____.
 - A. constraints
 - B. basic requirements
 - C. **objective function**
 - D. equations

4. A feasible solution of LPP
 - A. **Must satisfy all the constraints simultaneously**
 - B. Need not satisfy all the constraints,
 - C. Must be a corner point of the feasible region
 - D. Satisfy some of the constraints

5. Maximization of objective function in LPP means
 - A. Value occurs at allowable set decision
 - B. **Highest value is chosen among allowable decision**
 - C. **Lowest value is chosen among allowable decision**
 - D. negative value among the variables

6. Linear programming problem involving only two variables can be solved by
 - A. Big M Method
 - B. Simplex method
 - C. **Graphical method**
 - D. M-Technique

7. All negative constraints must be written as

- a) Equality b) Non equality c) **Greater than or equal to** d) Less than or equal
8. In linear programming, lack of points for a solution set is said to
- a) **Have no feasible solution** b) have a feasible solution
c) Have single point methods d) have infinite point method
9. Column in simplex initial table used to represent new basic variable is classified as
- a) **Column variable** b) key column c) key row d) row variable
10. In simplex method, slack, surplus and artificial variables are restricted to be
- a) Multiplied b) negative c) **non-negative**
d) divided
11. Constraint in LP problem are called active if they
- a) **Represent optimal solution** b) At optimality do not consume all the available resources
c) Both of (a) and (b) d) None of the above
12. Alternative solutions exists of an LP model when
- a) One of the constraints is redundant. b) **Objective function equation is parallel to one of the constraints**
c) Two constraints are parallel. d) all of the above
13. In simplex method basic solution set as $(n-m)$, all variables other than basic are classified as
- a) Constant variable b) non-positive variables
c) **Basic variables** d) non-basic variable
14. In simplex method, feasible basic solution must satisfy the
- a) **non-negativity constraint** b) negativity constraint
c) Basic constraint d) common constraint
15. In Simplex method, we add ____ variables

- a) Slack variables b) surplus variables c) artificial variables **d) basic variables**
16. Any set of non-negative allocations ($X_{ij} > 0$) which satisfies the row and column sum (rim requirement) is called a -----
- a) Linear programming b) Basic feasible solution c) **Feasible solution** d) None of the above
17. A feasible solution is called a basic feasible solution if the number of non-negative allocations is equal to -----
- a) $M-n+1$ b) $m-n-1$ c) **$m+n-1$** d) None of the above
18. A BFS of a LPP is said to be _____ if at least one of the basic variable is zero
- a) Degenerate **b) Non-degenerate** c) Infeasible d) un bounded
19. Operations research analysts do not
- a) **Predict future operations** b) Build more than one model c) Collect relevant data d) Recommend decision and accept
20. In linear programming problem if all constraints are less than or equal to, then the feasible region is
- a) Above lines b) **Below the lines** c) Unbounded d) None of the above

UNIT-2

21. The TP is said to be unbalanced if _____.
- a) $\sum a_i = \sum b_j$ b) $\sum a_i \neq \sum b_j$ c) $\sum a_i \geq \sum b_j$ d) $\sum a_i \leq \sum b_j$
22. In non-degenerate solution number of allocated cell is _____.
- a. Equal to $m+n-1$ b. Equal to $m+n+1$ c. Not equal to $m+n-1$ d. Not equal to $m+n+1$
23. From the following methods _____ is a method to obtain initial solution to Transportation Problem.

- a. North-West b. **Hungarian** c. Simplex d. Newton Raphson
24. The Penalty in VAM represents difference between _____ cost of respective row / column.
- a. Two Largest b. largest and smallest c. **smallest two** d. none of them
25. Number of basic allocation in any row or column in Assignment Problem can be
- A. Exactly one B. **at least one** C. at most one D. none of them
26. North – West corner refers to _____.
- A. top left corner B. both C. **top right corner** D. none of them
27. The _____ method's solution for transportation problem is sometimes an optimal solution itself.
- A. NWCM B. LCM C. VAM D. **Row Minima**
28. In Assignment Problem, the value of decision variable x_{ij} is_____.
- A. no restriction B. **one or zero** C. two or one D. none of them
29. If number of sources is not equal to number of destination in Assignment problem then it is called _____.
- A. **unbalanced** B. unsymmetrical C. symmetric D. balanced
30. The _____ method used to obtain optimum solution of travelling salesman problem.
- A. Simplex B Dominance C. **Hungarian** D. graphical
31. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that
- A. the solution be optimal B. **the rim condition is satisfied** C. the solution not be degenerate D. the solution be negative.
32. The dummy source or destination in a transportation problem is added to

- A. **satisfy rim condition** B. prevent solution from becoming degenerate C. ensure that total cost does not exceed a limit D. does not satisfy the rim.
33. The occurrence of degeneracy while solving a transportation problem means that
- A. **total supply equals total demand** B. the solution so obtained is not feasible C. the few allocations become negative D. total supply not equals total demand.
34. An assignment problem is said to be balanced if _____
- A) **No. of rows = no.of columns** b) No. of rows \neq no.of column
c) No. of rows \leq no.of columns d) No. of rows \geq no.of columns
35. A transportation problem is said to be balanced if_____
- a) $\sum a_i = \sum b_j$ b) $\sum a_i \neq \sum b_j$ c) $\sum a_i \leq \sum b_j$ d) $\sum a_i \geq \sum b_j$
36. To make an unbalanced assignment problem balanced, what are added with all entries as zeroes?
- a) Dummy rows b) Dummy columns c) **Both A and B** d) Dummy entries
37. Any feasible solution to a transportation problem containing m origins and n destinations is said to be -----
- a) Independent b) Degenerate c) **Non-degenerate** d) Both A and B
38. According to transportation problem number of basic cells will be exactly -----
- a) $M+n-0$ b) $n+m-1$ c) **$m+n-1$** d) None of the above
39. The allocated cells in the transportation table are called -----
- a) Occupied cells b) Empty cells c) **Both A and B** d) Unoccupied cells
40. Once the initial basic feasible solution has been computed , what is the next step in the problem
- a) VAM b) Modified distribution method c) **Optimality test** d) None of the above

41. Activity which starts only after finishing other activity is called _____.
- A. dummy B. **Successor** C. Predecessor D. none of them
42. Burst and Merge are types of _____ in networking.
- A. **event** B. arrow C. Activity D. tools
43. Activity which does not require any resources or time is called _____.
- A. **dummy** B. successor C. Predecessor D. Extra
44. Event indicates _____ of activity.
- A. starting B. . Ending C. **both A and B** D. Centre.
45. _____ is indicated by dotted arrow.
- A. burst event B. **dummy activity** C. merge event D. event
46. _____ Event represents beginning of more than one activity.
- A. **burst** B. Dummy C. Merge D. splitting
47. Merge event represents _____ of two or more events.
- A. beginning B. Splitting C. **Completion** D. Dummy
48. Activity which is completed before starting new activity is called _____.
- A. dummy B. **successor** C. predecessor D. Merger
49. The Objective of network analysis to
- A. **Minimize total project duration** B. Minimize total project cost
C. Minimize production delays, interruption and conflicts D. All of the above
50. Network models have advantage in terms of project
- A. Planning B. Controlling C Scheduling D. **All of the above**
51. The Another term commonly used for activity slack time is
- A. Total float C. independent floats B. Free float D. **All of the above**

52. 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 progressing well D. It does not a dummy activity
53. 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 them
 C. **Both A and B** D. None of the above
54.is an activity oriented diagram.
- a) **CPM** b) PERT c) Histogram d) None of the above
55. is the duration by which an activity can be delayed without delaying the project.
- a) **Total floats** b) Slack c) Earliest event time
56.is activity oriented.
- a) **CPM** b) PERT c) LP d) None of the above
57. is event oriented.
- a) CPM b) **PERT** c) LP d) None of the above
58. PERT emphasis on
- a)**Time** b) Activity c) a) and b) d) None of the above
59. Full form of PERT is
- a) Performance evaluation review technique b) **Programme Evaluation Review technique** c) Programme Evaluation Research Technique d) none of these
60.is that sequence of activities which determines the total project time.
- a) Net work b) **Critical path** c) Critical activities d) None of the above

UNIT-4

61. Reduction in procurement cost ____ EOQ.
- a) **Reduces** b) increases c) equals d) not equals
62. The following classes of costs are usually involved in inventory decisions except
- a. Cost of ordering b. Carrying cost c. Cost of shortages d. **Machining cost**
63. Decision variables are
- a) **Controllable** b) Uncontrollable c) Parameters d) None of the above
64. Inventory costs include
- a. carrying
b. ordering
c. shortage costs
d. **all of the above**
65. In an _____ inventory system a constant amount is ordered when inventory declines to a predetermined level.
- a. optional
b. **economic**
c. periodic
d. continuous
66. EOQ is (an) _____ inventory system.
- a. periodic
b. continuous
c. optimal
d. **economic**
67. As order size increases, total
- a. inventory costs will increase, reach a maximum and then quickly decrease.
b. **inventory cost will decrease, reach a minimum and then increase.**
c. ordering costs will initially increase while total carrying cost will continue to decrease
d. carrying cost decreases while the total ordering cost increases
68. **Which of the following is not an inventory?**
- a) **Machines**
b) Raw material
c) Finished products
d) Consumable tools
69. The following classes of costs are usually involved in inventory decisions except
- a) Cost of ordering b) Carrying cost
c) Cost of shortages d) **Machiningscost**

70. **The cost of insurance and taxes are included in**
 a) Cost of ordering b) Set up cost
 c) **Inventory carrying** d) Cost of shortages
71. **'Buffer stock' is the level of stock**
 a) Half of the actual stock
 b) At which the ordering process should start
 c) **Minimum stock level below which actual stock should not fall**
 d) Maximum stock in inventory
72. **The minimum stock level is calculated as**
 a) **Reorder level – (Normal consumption x Normal delivery time)**
 b) Reorder level + (Normal consumption x Normal delivery time)
 c) (Reorder level + Normal consumption) x Normal delivery time
 d) (Reorder level + Normal consumption) / Normal delivery time
73. **Re-ordering level is calculated as**
 a) **Maximum consumption rate x Maximum re-order period**
 b) Minimum consumption rate x Minimum re-order period
 c) Maximum consumption rate x Minimum re-order period
 d) Minimum consumption rate x Maximum re-order period
74. Work in progress means
 a) **Partly finished goods** b) finished goods c) completed goods d) raw materials
75. _____ level of stock at which a future replenishment order should be placed
 a) **Re order level** b) maximum level c) minimum level d) all of the above.
76. _____ Level as selected as the maximum desirable which is used as an indicator.
 a) **Maximum stock** b) Re order level c) maximum level d) minimum level
77. _____ is called Cost of obtaining stock.
 a) Ordering cost b) direct cost c) indirect cost d) buffer stock.
78. _____ Cost is associated with running out of stock.
 a) **Stock out** b) Maximum stock c) ordering d) holding
79. _____ is the period of time between ordering and replenishment.
 a) **Lead time** b) Activity c) review d) idle time
80. _____ model is one which assumes complete certainty
 a) **Deterministic model** b) stochastic model
 c) Static model d) dynamic model.

UNIT -5

81. The technique of conducting experiment on a model of a system is called _____

- a) Simulation b) random c) inventory d) ABC model
82. The well known model used in simulation is called _____
- a) **Monte carlo** b) Marvelcarlo c) marinecarlo d) chisquare
83. A simulation model uses the mathematical expressions and logical relationships of the _____
- a) **Real system** b) computer model c) performance measure d) interface
84. A path formed by allowing horizontal and vertical lines and the entire corner cells of which are occupied is called a _____
- a) Occupied path b) Open path c) **Closed path** d) none of the above
85. Basic cells indicate positive values and non- basic cells have _____ value for flow
- a) **Negative** b) Positive c) One d) zero.
86. The objective of network analysis is to
- a) **Minimize total project duration** b) Minimize total project cost c) Minimize production delays, interruption and conflicts d) All of the above .
87. For decision making under uncertainty, identify the decision rule that is appropriate for the optimist.
- a) Laplace b) **Maximax** c) Minimax regret d) Maxmin
88. Which of the following is not a part of decision tree problem specification?
- a) a list of alternatives b) A list of possible state of nature c) **EVPI** d) Pay off associated with alternative/ state of nature combination.
89. If a decision theory problem has 3 decision alternatives and 4 states of nature, the number of payoffs in that problem will be
- a) 3 b) 4 c) **12** d) 64

90. In a decision theory problem under complete uncertainty, which one of the following approaches will not be possible?
- a) **Expected monetary value** b) Maxmin c) Minimax d) Hurwicz
91. For decision making under uncertainty, identify the decision rule that is appropriate for the optimist.
- a) Laplace b) **Maximax** c) Minimax regret d) Maxmin
92. What decision-making condition must exist for the decision tree to be a valuable tool?
- a) Certainty b) Uncertainty c) **Risk** d) It does not matter, the tool is appropriate in all environments
93. Which of the following is (are) types of decision-making environments?
- a) Decision making under uncertainty b) **Decision making under uncertainty** c) Decision making under risk d) None of the above
94. A good decision always implies that
- a) Will obtain the best final results b) **Have used appropriate quantitative analysis.** c) Have considered all alternatives d) Have followed a logical process.
95. All of the following are steps in the decision-making process except
- a) Define the problem b) List alternatives c) Identify the possible outcomes d) **Compute the posterior probabilities.**
96. The equally likely decision criteria is also known as
- a) Bayes b) **Laplace** c) Minimax d) Hurwicz
97. Opportunity loss refers to
- a) The expected value of a bad decision
b) The expected loss from a bad decision
c) **The difference between actual pay off and the optimal pay off** d) the regret from not having made a decision

98. _____ is EVPI
- a) **Expected value of perfect information** b) Early value of perfect information c) Earning value of perfect information d) Expected value of positive information
99. _____ is an optimistic rule.
- a) **Maximax criterion** b) Maxi min criterion c) Mini max d) Laplace
100. _____ is the criterion for the selection of the best among the worst.
- a) Maxi max criterion b) **Maxi min criterion** c) Mini max d) Laplace

QUANTITATIVE TECHNIQUES FOR FINANCE

UNIT 1

1. What is LPP?
LPP deals with the optimization of maximization or minimization of decision variables.
2. Define Degenerate basic solution.
A basic solution is said to be degenerate if one or more variables are zero.
3. Define non degenerate basic solution
If none of the variables are zero, then it is called non degenerate basic solution
4. State the advantage of LPP.
It makes a scientific and mathematical analysis of the problem situations
By using LPP the decision maker makes sure he is considering optimal solution.
5. What is mathematical model?
Set of mathematical symbols to represent the decision variables of a system.
6. State the character of LPP?
The number of variables should be small.
7. What is Iterative procedure?
Repeating the procedure until further improvement is not possible.
8. What is feasible solution?
The bounded region is known as feasible solution.
9. What is slack variable?
The variable is added to the constraint of less than equal type.
10. What is surplus variable?
For the constraint of greater than equal to type we make a surplus variable.

UNIT 2

11. What is assignment problem?
Given 'n' facilities and 'n' jobs and given the effectiveness of each facility for each job.
12. What is transportation model?
Level of supply at each source and the amount of demand at each destination.
13. What is unbalanced transportation problem?
If total demand is not equal to supply then it is unbalanced transportation problem.
14. What do you mean by Northwest corner rule?
It is a method to obtain initial basic feasible solution.
15. What is Hungarian method?
The method used to obtain optimum solution to travelling salesman problem.
16. State the purpose of introducing dummy variable?
Obtain balance between total activities and total resources.
17. What do you mean by VAM method?
Row wise and column wise difference between two minimum costs is calculated under VAM method.

18. When the assignment problem said to be balanced?
If No. of Rows = NO. Of columns then the problem is said to be balanced
19. When the assignment problem said to be Unbalanced?
If No. of Rows is not equal to NO. Of columns then the problem is said to be Unbalanced.
20. What is the purpose of using MODI method?
To obtain optimum solution

UNIT 3

21. What is project?
A project is defined as a combination of interrelated activities all of which must be executed in certain order to achieve a goal.
22. What do you mean by activity?
It is a task or item of work to be done in a project.
23. What is float?
It is a difference between the latest finish and earliest finish of the activity.
24. What is critical path?
Path connectivity the first node to the very last terminal node, is called critical path.
25. What are the types of floats?
Total float, free float and independent float.
26. How many time estimates involved in PERT problems?
3 time estimates involved in PERT
27. Write Abbreviation for PERT.
Project evaluation and review technique.
28. Write Abbreviation for CPM.
Critical path method.
29. What is the use of float?
Floats are useful in resource leveling and allocating.
30. Define Crash time?
It is the duration up to which the normal duration of an activity can be shortened by adding extra resources.

UNIT -4

31. Define Inventory.
It may defined as the stock of goods or commodities that are reserved for smooth running of business.
32. What are the types of inventories?
Fluctuation inventory and anticipated inventories.
33. What is the reason for maintaining inventory?
It helps for smooth running of business.
Provide service to the customers at short time.
34. What is holding cost?

Cost associated with carrying the goods in stock is known as holding cost.

35. What is shortage cost?

The penalty costs that are incurred as a result of running out of stock are called as shortage cost.

36. What is set up cost?

These costs are associated with obtaining goods through setting up a machinery before starting production.

37. List out the kinds of variables in inventory.

Controlled variables and uncontrolled variables

38. What is lead time?

Elapsed time between the placement of the order and its receipts in inventory is known as lead time.

39. Define EOQ.

EOQ is the size of order which minimizes total amount cost of carrying inventory and the cost of ordering under the assumed conditions of certainty and test annual demands are known.

40. What are the costs involved in inventory?

Holding cost, shortage cost and setup cost.

UNIT-5

41. What is Simulation?

Simulation is the representation of reality in some physical form.

42. Write any two examples for Simulation.

Air craft model and children cycling park.

43. What are the advantages of Simulation?

Less complicated and flexible.

44. What are the limitations of Simulation?

Simulation may not yield optimum results

Simulation may not be less time consuming.

45. When Simulation can be used?

Simulation used for solving inventory and queuing problems.

46. Mention well known technique used in Simulation.

Monte carlo.

47. What are the uses of Simulation?

Solving inventory and queuing problems

48. What is Monte carlo Simulation?

The technique involves the selection of random observations with in the Simulation model.

49. What do you mean by random number?

Random number is a number whose probability of occurrence is the same as that of any other number in the collection.

50. Write the method of generating random number.

Pseudo random number.

K3 Level

Unit 1

1. A firm engaged in producing two

models A and B perform three operations – painting, assembly and testing. The relevant data are as follows:

		Hours Required for each unit		
Model	Unit Sale Price	Assembly	Painting	Testing
A	Rs.50	1.0	0.2	0.0
B	Rs.80	1.5	0.2	0.1

Total no. of hours available is: Assembly 600, Painting 100, and Testing 30. Determine weekly production schedule to maximize the profit.

2. Solve graphically the following L.P.P

$$\text{Maximize } Z = 5X_1 + 3X_2$$

S.T.C:

$$3x_1 + 5x_2 \leq 15$$

$$5X_1 + 2x_2 \leq 10$$

$$\text{And } x_1, x_2 \geq 0$$

3. An animal feed company must produce 200 kgs of a mixture consisting of ingredient X1 and X2 daily. X1 costs Rs.3 per kg and X2 Rs.8 per Kg. Not more than 80 kgs of x1 can be used and at least 60 kgs of x2 must be used. Find how much of each ingredient should be used if the company wants to minimum cost. Make LPP.
4. Solve the problem by using Graph.

$$\text{Max } Z = 22x_1 + 18x_2$$

S.T.C

$$360x_1 + 240x_2 \leq 5760$$

$$X_1 + x_2 \leq 20$$

$$X_1, x_2 \geq 0$$

5. Explain the essential characteristics and limitations of linear programming problem.

UNIT -2

6. Solve the following transportation problem.

	Supply			
	50	30	220	1
	90	45	170	3
	250	200	50	4
Demand	4	2	2	

7. Solve the following travelling sales man problem.

		TO			
		A	B	C	D
FROM	A	-	46	16	40
	B	41	-	50	40
	C	82	32	-	60
	D	40	40	36	-

8. Find the starting solution of the following transportation model by using Northwest corner rule

1	2	6	7
0	4	2	12
3	1	5	11
10	10	10	

9. Obtain the initial solution for the following transportation problem by using least cost method.

2	7	4	5
3	3	1	8
5	4	7	7
1	6	2	14
7	9	18	

10. Solve the following travelling salesman problem

A	B	C	D
-	46	16	40
41	-	50	40
82	32	-	60
40	40	36	-

UNIT -3

11. Draw the Network for the project whose activities and their precedence relationships are given below:

Activity:	P	Q	R	S	T	U
Predecessors:	-	-	-	P,Q	P,R	Q,R

12. Construct the network for the project whose activities and their relationships are as given below:

Activities: A, D, E can start simultaneously, Activities: B, C > A; G,F > D, C; H > E, F.

13. If there are 5 activities P, Q, R, S and T such that P,Q,R have no immediate predecessors but S and T have immediate predecessors P,Q and Q,R respectively. Represent this situation by a network.

14. Draw a network.

Activity:	A	B	C	D	E
Predecessors:	-	A	A	A	B,C,D

15. Explain the following a) Total float, b) free float and c) independent float.

UNIT-4

16. For an item the storage cost of one item is Rs. 1 per month and the set up cost is RS.25 per run. If the demand is 200n units per month, find the optimum quantity to be produced.

17. The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges 25 % p.a. If the cost of procurement is Rs.150 determine

i) EOQ ii) time between two consecutive orders iii) number of orders per year

iv) optimal cost.

18. List out the formula EOQ and C1 and C3.
19. A company uses rivets at a rate of 5000 kg per year, rivets costing 2.00 kg. It costs Rs.20 to place an order and carrying cost of inventory is 10 % per year. How frequently should the order for rivets be placed and how much?
20. A company has a demand of 12000 units/year for an item and it can produce 2000 such items per month. The cost of one setup is Rs.400 and the holding cost/unit/month is Rs.0.15. Find the optimum lot size, max inventory, manufacturing time, total time.

UNIT-5

21. A small industry finds from the past data that the cost of making an item is Rs. 25 the selling price of an item is Rs.30 if it is sold within a week and it could be disposed at Rs. 20 per item at the end of the week.

Weekly sales	≤ 3	4	5	6	7	≥ 8
No. of weeks	0	10	20	40	30	0

Find the optimum number of items per week should the industry produce.

22. The probability distribution of monthly sales of an item is as follows:

Monthly sales	0	1	2	3	4	5	6
Probabilities	.01	.06	.25	.30	.22	.10	.06

The cost of carrying inventory is 30 per unit per month and the cost of unit shortage is Determine optimum stock

23. A milkman buys milk at Rs.2.50 per litre. Unsold milk has to be thrown away. The daily demand has the following probabilities.

Demand	46	48	50	52	54	56	58	60	62	64
probability	.01	.03	.06	.10	.20	.25	.15	.10	.05	.06

How much order should be ordered every day?

24. Examine the criterion for decision making.
25. Analyze about decision tree.

UNIT 1

1. A Company manufactures two types of boxes corrugated box and ordinary cartons. The boxes undergo two major processes. That is cutting and spinning operations. The profits per unit are Rs.6 and Rs.4 respectively. Each corrugated box requires 2 minutes for cutting and 3 minutes for spinning operations. Whereas each carton box requires 2 minutes for cutting and 1 minutes for spinning. The available operating time is 120 minutes and 60 minutes for cutting and spinning machines. Determine the optimum quantities of two boxes to maximize the profits.

Solve the L.P.P by using graph.

2. Use simplex method to solve the

$$\text{LPP Max} = 4x_1 + 10x_2$$

Subject to constraints

$$2x_1 + x_2 \leq 50$$

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

$$2x_1 + 3x_2 \leq 90 \text{ and } x_1, x_2 \geq 0$$

3. A person wants to decide the constituents of a diet which will fulfill his daily requirements of proteins, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the following table.

Food type	Yield/Unit			Cost/unit (Rs)
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

Formulate the L.P model for the problem and draw a graph.

4. Apply graphical method to find non negative values of x_1 and x_2 which minimizes $z = 10x_1 + 25x_2$ subject to $x_1 + x_2 \geq 50$, $x_1 \geq 20$, $x_2 \geq 40$.
5. An animal feed company must produce 200 kgs of a mixture consisting of ingredient X_1 and X_2 daily. X_1 costs Rs.3 per kg and X_2 Rs.8 per Kg. Not more than 80 kgs of x_1 can be used and at least 60 kgs of x_2 must be used. Find how much of each ingredient should be used if the company wants to minimum cost. make LPP.

UNIT 2

6. Solve the following transportation problem by using least cost method North west corner rule.

	Supply			
	50	30	220	1
	90	45	170	3
	250	200	50	4
Demand	4	2	2	

7. Consider the problem of assigning 5 jobs to 5 persons. The assignment costs are given as follows:

8	4	2	6	1
0	9	5	5	4
3	8	9	2	6
4	3	1	0	3
9	5	8	9	5

Determine the optimum assignment schedule

8. Solve the Transportation problem MODI method.

21	16	25	13	11
17	18	14	23	13
32	27	18	41	19
6	10	12	15	

9. Find the initial solution for the following transportation problem by using VAM method.

11	13	17	14	250
16	18	14	10	300

21	24	13	10	400
200	225	275	250	

10. Obtain the initial solution for the following transportation problem by using least cost method.

2	7	4	5
3	3	1	8
5	4	7	7
1	6	2	14
7	9	18	

UNIT 3

11. Compute the earliest start, earliest finish, latest start, latest finish of each activity of the project given below:

Activity:	1-2	1-3	2-4	2-5	3-4	4-5
Duration:	8	4	10	2	5	3

12. Calculate the total float free float and independent float for the project given below:

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration	8	7	12	4	10	3	5	10	7	4

13. Draw the network and determine the critical path for the given data:

Jobs	1-2	2-3	3-4	3-7	4-5	4-7	5-6	6-7
Duration	3	4	4	4	2	2	3	2

14. Construct the network for the project whose activities and the 3 time estimates For these activities are given below. Compute

- Expected duration of each activity
- Expected variance of each activity

c) Expected variance of each project length

Activity	To	Tm	Tp
1-2	3	4	5
2-3	1	2	3
2-4	2	3	4
3-5	3	4	5
4-5	1	3	5
4-6	3	5	7
5-7	4	5	6
6-7	6	7	8
7-8	2	4	6
7-9	1	2	3
8-10	4	6	8
9-10	3	5	7

15. Compute the earliest start, earliest finish latest start and latest finish of each activity of

the project given below:

Activity: 1-2 1-3 2-4 2-5 3-4 4-5

Duration: 8 4 10 2 5 3

UNIT-4

16. The annual demand for an item is 12000 per year and the shortages are allowed. If the unit cost is Rs.15 and the holding cost is Rs.20 per year per unit determine the optimum total yearly cost. The cost of placing one order is Rs.6000 and the cost of one shortage is Rs.100 per year.

17. Find the optimal ordering quantity for the following:

Annual usage	1000 pieces
Cost per piece	Rs.250

Ordering cost	Rs.6 per order
Expediting cost	Rs.4 per order
Inventory holding cost 20% of average inventory	

18. For an item, the production is instantaneous. The storage cost of one item is Rs. 1 per month and the set up cost is Rs.25 per run. If the demand is 200 units per month. Find the optimum quantity to be produced per set up and hence determine the total cost of storage and set up per month.

19. A manufacturer has to supply his customer with 600 units of his products per year. Shortage is not allowed and storage cost amounts to 60 paise per unit per year. The set up cost is Rs.80 find

i) The EOQ

ii) The minimum average yearly cost.

iii) The optimum number of orders per year.

iv) The optimum period of supply per order.

20. Explain about importance of inventory control.

UNIT-5

21. A small industry finds from the past data, that the cost of making an item is Rs.25 the selling price of an item is Rs.30 if it is sold within a week and it could be disposed at Rs.20 per item at the end of the week.

Weekly sales	≤ 3	4	5	6	7	≥ 8
No. of weeks	0	10	20	40	30	0

Find the optimum number of items per week should the industry produce. (OR)

22. A distributor of a certain product incurs holding cost of Rs. 100 per unit per week and shortage cost of Rs.300 per unit. The data on the sales of the product are given below

Weekly sales(units)	0	1	2	3	4	5	6	7	8
No. of weeks frequency	0	0	5	10	15	15	5	0	0

How many units should the distributor buy every week? Also find E.V.P.I.

23. An Automobile Production line turns out about 100 cars a day, but deviators occur

owing to many causes. The production is more accurately described by the probability

ty distribution givenbelow:

Production per day	Probability
95	0.03
96	0.05
97	0.07
98	0.10
99	0.15
100	0.20
101	0.15
102	0.10
103	0.07
104	0.05
105	0.03
	1.00

Finished cars are transported across the bay at the end of each day by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped and what will be the average number of empty spaces on the ship? (Random numbers are 97,02,80,66,,96,55,50,29,58,51,04,86,24,39,47)

24. Frontier Bakery keeps stock of a popular brand of cake. Daily demand based on past experience is as given below: -

Experience indicates Daily demand: 0 15 25 35 45 50

Probability : .01 .15 .20 .50 .12 .02

Consider the following sequence of random numbers:-

R. No. 48, 78, 09, 51, 56, 77, 15, 14, 68, 09

Using the sequence, simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

25. A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 mopped to 204 mopped, whose probability distribution is as given below: -

Production per day	Probability
196	0.09
197	0.05
198	0.12
199	0.14
200	0.20
201	0.15
202	0.11
203	0.08
204	0.06

The finished mopeds are transported in a specially designed three storeyed lorry that can accommodate only 200 mopped. Using the following 15 random numbers 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54, 10, simulate the process to find out:

- (i) What will be the average number of mopeds waiting in the factory?
- (ii) What will be the average number of empty spaces on the lorry?

QUANTITATIVE TECHNIQUES FOR FINANCE

UNIT 1

1. In graphical representation the bounded region is known as ____ region.
 - A. Solution
 - B. **Feasible solution**
 - C. basic solution
 - D. optimal

2. In Degenerate solution value of objective function _____.
 - A. Increases infinitely
 - B. Decreases infinitely
 - C. basic variables are nonzero
 - D. **One or more basic variables are zero**

3. The linear function of variables which is to be maximized or minimized is called _____.
 - A. constraints
 - B. basic requirements
 - C. **objective function**
 - D. equations

4. A feasible solution of LPP
 - A. Must satisfy all the constraints simultaneously
 - B. Need not satisfy all the constraints,
 - C. Must be a corner point of the feasible region
 - D. Satisfy some of the constraints

5. Maximization of objective function in LPP means
 - A. Value occurs at allowable set decision
 - B. Highest value is chosen among allowable decision
 - C. Lowest value is chosen among allowable decision
 - D. negative value among the variables

6. Linear programming problem involving only two variables can be solved by
 - A. Big M Method
 - C. **Graphical method**

B. Simplex method

D. M-Technique

7. All negative constraints must be written as
- a) Equality
 - b) Non equality
 - c) **Greater than or equal to**
 - d) Less than or equal
8. In linear programming, lack of points for a solution set is said to
- a) **Have no feasible solution**
 - b) have a feasible solution
 - c) Have single point methods
 - d) have infinite point method
9. Column in simplex initial table used to represent new basic variable is classified as
- a) **Column variable**
 - b) key column
 - c) key row
 - d) row variable
10. In simplex method, slack, surplus and artificial variables are restricted to be
- a) Multiplied
 - b) negative
 - c) **non-negative**
 - d) divided
11. Constraint in LP problem are called active if they
- a) **Represent optimal solution**
 - b) At optimality do not consume all the available resources
 - c) Both of (a) and (b)
 - d) None of the above
12. Alternative solutions exists of an LP model when
- a) One of the constraints is redundant.
 - b) **Objective function equation is parallel to one of the constraints**
 - c) Two constraints are parallel.
 - d) all of the above
13. In simplex method basic solution set as $(n-m)$, all variables other than basic are classified as
- a) Constant variable
 - b) non-positive variables
 - c) **Basic variables**
 - d) non-basic variable
14. In simplex method, feasible basic solution must satisfy the

a) **non-negativity constraint** b) negativity constraint

c) Basic constraint

d) common constraint

15. In Simplex method, we add _____ variables

a) Slack variables b) surplus variables c) artificial variables d) **basic variables**

16. Any set of non-negative allocations ($X_{ij} > 0$) which satisfies the row and column sum (rim requirement) is called a -----

a) Linear programming b) Basic feasible solution c) **Feasible solution** d) None of the above

17. A feasible solution is called a basic feasible solution if the number of non-negative allocations is equal to -----

a) $M-n+1$ b) $m-n-1$ c) **$m+n-1$** d) None of the above

18. A BFS of a LPP is said to be _____ if at least one of the basic variable is zero

a) Degenerate b) **Non-degenerate** c) Infeasible d) un bounded

19. Operations research analysts do not

a) **Predict future operations** b) Build more than one model c) Collect relevant data d) Recommend decision and accept

20. In linear programming problem if all constraints are less than or equal to, then the feasible region is

a) Above lines b) **Below the lines** c) Unbounded d) None of the above

UNIT-2

21. The TP is said to be unbalanced if _____.

a) **$\sum a_i = \sum b_j$** b) $\sum a_i \neq \sum b_j$ c) $\sum a_i \geq \sum b_j$ d) $\sum a_i \leq \sum b_j$

22. In non-degenerate solution number of allocated cell is_____.
- a. Equal to $m+n-1$ b. Equal to $m+n+1$ c. Not equal to $m+n-1$ d. Not equal to $m+n+1$
23. From the following methods _____ is a method to obtain initial solution to Transportation Problem.
- a. North-West b. **Hungarian** c. Simplex d. Newton Raphson
24. The Penalty in VAM represents difference between _____ cost of respective row / column.
- a. Two Largest b. largest and smallest c. **smallest two** d. none of them
25. Number of basic allocation in any row or column in Assignment Problem can be
- A. Exactly one B. **at least one** C. at most one D. none of them
26. North – West corner refers to _____.
- A. top left corner B. both C. **top right corner** D. none of them
27. The _____ method's solution for transportation problem is sometimes an optimal solution itself.
- A. NWCM B. LCM C. VAM D. **Row Minima**
28. In Assignment Problem, the value of decision variable x_{ij} is_____.
- A. no restriction B. **one or zero** C. two or one D. none of them
29. If number of sources is not equal to number of destination in Assignment problem then it is called _____.
- A. **unbalanced** B. unsymmetrical C. symmetric D. balanced
30. The _____ method used to obtain optimum solution of travelling salesman problem.
- A. Simplex B Dominance C. **Hungarian** D. graphical

31. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that
- A. the solution be optimal B. **the rim condition is satisfied** C. the solution not be degenerate D. the solution be negative.
32. The dummy source or destination in a transportation problem is added to
- A. **satisfy rim condition** B. prevent solution from becoming degenerate C. ensure that total cost does not exceed a limit D. does not satisfy the rim.
33. The occurrence of degeneracy while solving a transportation problem means that
- A. **total supply equals total demand** B. the solution so obtained is not feasible C. the few allocations become negative D. total supply not equals total demand.
34. An assignment problem is said to be balanced if _____
- A) **No. of rows = no.of columns** b) No. of rows \neq no.of column
c) No. of rows \leq no.of columns d) No. of rows \geq no.of columns
35. A transportation problem is said to be balanced if _____
- a) $\sum a_i = \sum b_j$ b) $\sum a_i \neq \sum b_j$ c) $\sum a_i \leq \sum b_j$ d) $\sum a_i \geq \sum b_j$
36. To make an unbalanced assignment problem balanced, what are added with all entries as zeroes?
- a) Dummy rows b) Dummy columns c) **Both A and B** d) Dummy entries
37. Any feasible solution to a transportation problem containing m origins and n destinations is said to be -----
- a) Independent b) Degenerate c) **Non-degenerate** d) Both A and B
38. According to transportation problem number of basic cells will be exactly -----
- a) $M+n-0$ b) $n+m-1$ c) **$m+n-1$** d) None of the above
39. The allocated cells in the transportation table are called -----

- a) Occupied cells b) Empty cells c) **Both A and B** d) Unoccupied cells
40. Once the initial basic feasible solution has been computed, what is the next step in the problem
- a) VAM b) Modified distribution method c) **Optimality test** d) None of the above

Unit -3

41. Activity which starts only after finishing other activity is called _____.
- A. dummy B. **Successor** C. Predecessor D. none of them
42. Burst and Merge are types of _____ in networking.
- A. **event** B. arrow C. Activity D. tools
43. Activity which does not require any resources or time is called _____.
- A. **dummy** B. successor C. Predecessor D. Extra
44. Event indicates _____ of activity.
- A. starting B. Ending C. **both A and B** D. Centre.
45. _____ is indicated by dotted arrow.
- A. burst event B. **dummy activity** C. merge event D. event
46. _____ Event represents beginning of more than one activity.
- A. **burst** B. Dummy C. Merge D. splitting
47. Merge event represents _____ of two or more events.
- A. beginning B. Splitting C. **Completion** D. Dummy
48. Activity which is completed before starting new activity is called _____.

- A. dummy B. **successor** C. predecessor D. Merger
49. The Objective of network analysis to
- A. **Minimize total project duration** B. Minimize total project cost
C. Minimize production delays, interruption and conflicts D. All of the above
50. Network models have advantage in terms of project
- A. Planning B. Controlling C Scheduling D. **All of the above**
51. The Another term commonly used for activity slack time is
- A. Total float C. independent floats B. Free float D. **All of the above**
52. 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 progressing well D. It does not a dummy activity
53. 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 them
C. **Both A and B** D. None of the above
54.is an activity oriented diagram.
- a) **CPM** b) PERT c) Histogram d) None of the above
55. is the duration by which an activity can be delayed without delaying the project.
- a) **Total floats** b) Slack c) Earliest event time
56.is activity oriented.
- a) **CPM** b) PERT c) LP d) None of the above
57. is event oriented.

- a) CPM b) **PERT** c) LP d) None of the above
58. PERT emphasis on
- a) **Time** b) Activity c) a) and b) d) None of the above
59. Full form of PERT is
- a) Performance evaluation review technique b) **Programme Evaluation Review technique** c) Programme Evaluation Research Technique d) none of these
60.is that sequence of activities which determines the total project time.
- a) Net work b) **Critical path** c) Critical activities d) None of the above

UNIT-4

61. Reduction in procurement cost ____ EOQ.
- a) **Reduces** b) increases c) equals d) not equals
62. The following classes of costs are usually involved in inventory decisions except
- a. Cost of ordering b. Carrying cost c. Cost of shortages d. **Machining cost**
63. Decision variables are
- a) **Controllable** b) Uncontrollable c) Parameters d) None of the above
64. Inventory costs include
- a. carrying
b. ordering
c. shortage costs
d. **all of the above**
65. In an _____ inventory system a constant amount is ordered when inventory declines to a predetermined level.
- a. optional
b. **economic**

- c. periodic
 - d. continuous
66. EOQ is (an) _____ inventory system.
- a. periodic
 - b. continuous
 - c. optimal
 - d. **economic**
67. As order size increases, total
- a. inventory costs will increase, reach a maximum and then quickly decrease.
 - b. **inventory cost will decrease, reach a minimum and then increase.**
 - c. ordering costs will initially increase while total carrying cost will continue to decrease
 - d. carrying cost decreases while the total ordering cost increases
68. **Which of the following is not an inventory?**
- a) **Machines**
 - b) Raw material
 - c) Finished products
 - d) Consumable tools
69. The following classes of costs are usually involved in inventory decisions except
- a) Cost of ordering
 - b) Carrying cost
 - c) Cost of shortages
 - d) **Machining scost**
70. **The cost of insurance and taxes are included in**
- a) Cost of ordering
 - b) Set up cost
 - c) **Inventory carrying**
 - d) Cost of shortages
71. **'Buffer stock' is the level of stock**
- a) Half of the actual stock
 - b) At which the ordering process should start
 - c) **Minimum stock level below which actual stock should not fall**
 - d) Maximum stock in inventory
72. **The minimum stock level is calculated as**
- a) **Reorder level – (Normal consumption x Normal delivery time)**
 - b) Reorder level + (Normal consumption x Normal delivery time)
 - c) (Reorder level + Normal consumption) x Normal delivery time
 - d) (Reorder level + Normal consumption) / Normal delivery time
73. **Re-ordering level is calculated as**
- a) **Maximum consumption rate x Maximum re-order period**

- b) Minimum consumption rate \times Minimum re-order period
 c) Maximum consumption rate \times Minimum re-order period
 d) Minimum consumption rate \times Maximum re-order period
74. Work in progress means
 a) **Partly finished goods** b) finished goods c) completed goods d) raw materials
75. _____ level of stock at which a future replenishment order should be placed
 a) **Re order level** b) maximum level c) minimum level d) all of the above.
76. _____ Level as selected as the maximum desirable which is used as an indicator.
 a) **Maximum stock** b) Re order level c) maximum level d) minimum level
77. _____ is called Cost of obtaining stock.
 a) Ordering cost b) direct cost c) indirect cost d) buffer stock.
78. _____ Cost is associated with running out of stock.
 a) **Stock out** b) Maximum stock c) ordering d) holding
79. _____ is the period of time between ordering and replenishment.
 a) **Lead time** b) Activity c) review d) idle time
80. _____ model is one which assumes complete certainty
 a) **Deterministic model** b) stochastic model
 c) Static model d) dynamic model.

UNIT -5

81. The technique of conducting experiment on a model of a system is called _____
 a) Simulation b) random c) inventory d) ABC model
82. The well known model used in simulation is called _____
 a) **Monte carlo** b) Marvelcarlo c) marinecarlo d) chisquare
83. A simulation model uses the mathematical expressions and logical relationships of the _____
 a) **Real system** b) computer model c) performance measure d) interface
84. A path formed by allowing horizontal and vertical lines and the entire corner cells of which are occupied is called a -----
 a) Occupied path b) Open path c) **Closed path** d) none of the above
85. Basic cells indicate positive values and non- basic cells have ----- value for flow
 a) **Negative** b) Positive c) One d) zero.

86. The objective of network analysis is to
- a) **Minimize total project duration**
 - b) Minimize total project cost
 - c) Minimize production delays, interruption and conflicts
 - d) All of the above .
87. For decision making under uncertainty, identify the decision rule that is appropriate for the optimist.
- a) Laplace
 - b) **Maximax**
 - c) Minimax regret
 - d)Maxmin
88. Which of the following is not a part of decision tree problem specification?
- a) a list of alternatives
 - b) A list of possible state of nature
 - c) **EVPI**
 - d) Pay off associated with alternative/ state of nature combination.
89. If a decision theory problem has 3 decision alternatives and 4 states of nature, the number of payoffs in that problem will be
- a)3
 - b) 4
 - c) **12**
 - d) 64
90. In a decision theory problem under complete uncertainty, which one of the following approaches will not be possible?
- a) **Expected monetary value**
 - b) Maxmin
 - c) Minimax
 - d)Hurwicz
91. For decision making under uncertainty, identify the decision rule that is appropriate for the optimist.
- a) Laplace
 - b) **Maximax**
 - c) Minimax regret
 - d)Maxmin
92. What decision-making condition must exist for the decision tree to be a valuable tool?
- a) Certainty
 - b) Uncertainty
 - c) **Risk**
 - d) It does not matter, the tool is appropriate in all environments

93. Which of the following is (are) types of decision-making environments?

- a) Decision making under uncertainty
- b) **Decision making under uncertainty**
- c) Decision making under risk
- d) None of the above

94. A good decision always implies that

- a) Will obtain the best final results
- b) **Have used appropriate quantitative analysis.**
- c) Have considered all alternatives
- d) Have followed a logical process.

95. All of the following are steps in the decision-making process except

- a) Define the problem
- b) List alternatives
- c) Identify the possible outcomes
- d) **Compute the posterior probabilities.**

96. The equally likely decision criteria is also known as

- a) Bayes
- b) **Laplace**
- c) Minimax
- d) Hurwicz

97. Opportunity loss refers to

- a) The expected value of a bad decision
- b) The expected loss from a bad decision
- c) **The difference between actual pay off and the optimal pay off**
- d) the regret from not having made a decision

98. _____ is EVPI

- a) **Expected value of perfect information**
- b) Early value of perfect information
- c) Earning value of perfect information
- d) Expected value of positive information

99. _____ is an optimistic rule.

- a) **Maximax criterion**
- b) Maxi min criterion
- c) Mini max
- d) Laplace

100. _____ is the criterion for the selection of the best among the worst.

- a) Maxi max criterion
- b) **Maxi min criterion**
- c) Mini max
- d) Laplace

UNIT 1

1. What is LPP?
LPP deals with the optimization of maximization or minimization of decision variables.
2. Define Degenerate basic solution.
A basic solution is said to be degenerate if one or more variables are zero.
3. Define non degenerate basic solution
If none of the variables are zero, then it is called non degenerate basic solution
4. State the advantage of LPP.
It makes a scientific and mathematical analysis of the problem situations
By using LPP the decision maker makes sure he is considering optimal solution.
5. What is mathematical model?
This uses a set of mathematical symbols to represent the decision variables of a system.
6. State the character of LPP?
The number of variables should be small.
7. What is Iterative procedure?
Start with a trial solution and set of rules improving it by repeating the procedure until further improvement is not possible.
8. What is feasible solution?
The bounded region is known as feasible solution.
9. What is slack variable?
The variable is added to the constraint of less than equal type.
10. What is surplus variable?
For the constraint of greater than equal to type we make a surplus variable.

UNIT 2

11. What is assignment problem?
Given 'm' facilities and 'n' jobs and given the effectiveness of each facility for each job.
12. What is transportation model?
Level of supply at each source and the amount of demand at each destination.
13. What is unbalanced transportation problem?
If total demand is not equal to supply then it is unbalanced transportation problem.
14. What do you mean by Northwest corner rule?
It is a method to obtain initial basic feasible solution.
15. What is Hungarian method?
The method used to obtain optimum solution to travelling salesman problem.
16. State the purpose of introducing dummy variable?
Obtain balance between total activities and total resources.
17. What do you mean by VAM method?
Row wise and column wise difference between two minimum costs is calculated under VAM method.

18. When the assignment problem said to be balanced?
If No. of Rows = NO. Of columns then the problem is said to be balanced
19. When the assignment problem said to be Unbalanced?
If No. of Rows is not equal to NO. Of columns then the problem is said to be Unbalanced.
20. What is the purpose of using MODI method?
To obtain optimum solution
UNIT 3
21. What is project?
A project is defined as a combination of interrelated activities all of which must be executed in certain order to achieve a goal.
22. What do you mean by activity?
It is a task or item of work to be done in a project.
23. What is float?
It is a difference between the latest finish and earliest finish of the activity.
24. What is critical path?
Path connectivity the first node to the very last terminal node, is called critical path.
25. What are the types of floats?
Total float, free float and independent float.
26. How many time estimates involved in PERT problems?
3 time estimates involved in PERT
27. Write Abbreviation for PERT.
Project evaluation and review technique.
28. Write Abbreviation for CPM.
Critical path method.
29. What is the use of float?
Floats are useful in resource leveling and allocating.
30. Define Crash time?
It is the duration up to which the normal duration of an activity can be shortened by adding extra resources.
UNIT -4
31. Define Inventory.
It may defined as the stock of goods or commodities that are reserved for smooth running of business.
32. What are the types of inventories?
Fluctuation inventory and anticipated inventories.
33. What is the reason for maintaining inventory?
It helps for smooth running of business.
Provide service to the customers at short time.
34. What is holding cost?

Cost associated with carrying the goods in stock is known as holding cost.

35. What is shortage cost?

The penalty costs that are incurred as a result of running out of stock are called as shortage cost.

36. What is set up cost?

These costs are associated with obtaining goods through setting up a machinery before starting production.

37. List out the kinds of variables in inventory.

Controlled variables and uncontrolled variables

38. What is lead time?

Elapsed time between the placement of the order and its receipts in inventory is known as lead time.

39. Define EOQ.

EOQ is the size of order which minimizes total amount cost of carrying inventory and the cost of ordering under the assumed conditions of certainty and test annual demands are known.

40. What are the costs involved in inventory?

Holding cost, shortage cost and setup cost.

UNIT-5

41. What is Simulation?

Simulation is the representation of reality in some physical form.

42. Write any two examples for Simulation.

Air craft model and children cycling park.

43. What are the advantages of Simulation?

Less complicated and flexible.

44. What are the limitations of Simulation?

Simulation may not yield optimum results
Simulation may not be less time consuming.

45. When Simulation can be used?

Simulation used for solving inventory and queuing problems.

46. Mention well known technique used in Simulation.

Monte carlo.

47. What are the uses of Simulation?

Solving inventory and queuing problems

48. What is Monte carlo Simulation?

The technique involves the selection of random observations with in the Simulation model.

49. What do you mean by random number?

Random number is a number whose probability of occurrence is the same as that of any other number in the collection.

50. Write the method of generating random number.

Pseudo random number.

K3 Level

Unit 1

1. A firm engaged in producing two models A and B performs three operations – painting, assembly and testing. The relevant data are as follows:

		Hours Required for each unit		
Model	Unit Sale Price	Assembly	Painting	Testing
A	Rs.50	1.0	0.2	0.0
B	Rs.80	1.5	0.2	0.1

Total no. of hours available is: Assembly 600, Painting 100, and Testing 30.

Determine weekly production schedule to maximize the profit.

2. Solve graphically the following L.P.P

$$\text{Maximize } Z = 5X_1 + 3X_2$$

S.T.C:

$$3x_1 + 5x_2 \leq 15$$

$$5X_1 + 2x_2 \leq 10$$

$$\text{And } x_1, x_2 \geq 0$$

3. An animal feed company must produce 200 kgs of a mixture consisting of ingredient X1 and X2 daily. X1 costs Rs.3 per kg and X2 Rs.8 per Kg. Not more than 80 kgs of x1 can be used and at least 60 kgs of x2 must be used. Find how much of each ingredient should be used if the company wants to minimum cost. Make LPP.

4. Solve the problem by using Graph.

$$\text{Max } Z = 22x_1 + 18x_2$$

S.T.C

$$360x_1 + 240x_2 \leq 5760$$

$$x_1 + x_2 \leq 20$$

$$x_1, x_2 \geq 0$$

5. Explain the essential characteristics and limitations of linear programming problem.

K4 and K5 Level

UNIT 1

1. A Company manufactures two types of boxes corrugated box and ordinary cartons. The boxes undergo two major processes. That is cutting and spinning operations. The profits per unit are Rs.6 and Rs.4 respectively. Each corrugated box requires 2 minutes for cutting and 3 minutes for spinning operations. Whereas each carton box requires 2 minutes for cutting and 1 minutes for spinning. The available operating time is 120 minutes and 60 minutes for cutting and spinning machines. Determine the optimum quantities of two boxes to maximize the profits.

Solve the L.P.P by using graph.

2. Use simplex method to solve the LPP

$$\text{Max} = 4x_1 + 10x_2$$

Subject to constraints

$$2x_1 + x_2 \leq 50$$

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

$$2x_1 + 3x_2 \leq 90 \text{ and } x_1, x_2 \geq 0$$

3. A person wants to decide the constituents of a diet which will fulfill his daily requirements of proteins, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the following table.

Food type	Yield/Unit			Cost/unit (Rs)
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum Requirement	800	200	700	

Formulate the L.P model for the problem and draw a graph.

4. Apply graphical method to find non negative values of x_1 and x_2 which minimizes

$$z = 10x_1 + 25x_2 \text{ subject to } x_1 + x_2 \geq 50, x_1 \geq 20, x_2 \geq 40.$$

UNIT 2

K3 level

1. a) Solve the following transportation problem.

	Supply			
	50	30	220	1
	90	45	170	3
	250	200	50	4
Demand	4	2	2	

2. Solve the following travelling sales man problem.

		TO			
		A	B	C	D
FROM	A	-	46	16	40
	B	41	-	50	40
	C	82	32	-	60
	D	40	40	36	-

3. Find the starting solution of the following transportation model by using Northwest corner rule

1	2	6	7
0	4	2	12
3	1	5	11
10	10	10	

4. Obtain the initial solution for the following transportation problem by using least cost method.

2	7	4	5
---	---	---	----------

3	3	1	8
5	4	7	7
1	6	2	14
7	9	18	

5. Solve the following travelling salesman problem

A	B	C	D
-	46	16	40
41	-	50	40
82	32	-	60
40	40	36	-

K4 and K5 Level

1. Solve the following transportation problem by using least cost method North west corner rule.

	Supply			
	50	30	220	1
	90	45	170	3
	250	200	50	4
Demand	4	2	2	

2. Consider the problem of assigning 5 jobs to 5 persons. The assignment costs are given as follows:

8	4	2	6	1
0	9	5	5	4
3	8	9	2	6
4	3	1	0	3
9	5	8	9	5

Determine the optimum assignment schedule

3. Solve the Transportation problem MODI method.

21	16	25	13	11
17	18	14	23	13
32	27	18	41	19
6	10	12	15	

4. Find the initial solution for the following transportation problem by using VAM method.

11	13	17	14	250
16	18	14	10	300
21	24	13	10	400
200	225	275	250	

Unit 3

K3 Level

1. Draw the Network for the project whose activities and their precedence relationships are given below:

Activity:	P	Q	R	S	T	U
Predecessors:	-	-	-	P,Q	P,R	Q,R

2. Construct the network for the project whose activities and their relationships are as given below:

Activities: A, D, E can start simultaneously, Activities: B, C > A; G, F > D, C; H > E, F.

3. If there are 5 activities P, Q, R, S and T such that P, Q, R have no immediate predecessors but S and T have immediate predecessors P, Q and Q, R respectively. Represent this situation by a network.

4. Draw a network.

Activity:	A	B	C	D	E
Predecessors:	-	A	A	A	B, C, D

5. Explain the following a) Total float, b) free float and c) independent float.

K4 and K5 Level

1. Compute the earliest start, earliest finish, latest start, latest finish of each activity of the project given below:

Activity:	1-2	1-3	2-4	2-5	3-4	4-5
Duration:	8	4	10	2	5	3

(OR)

2. Calculate the total float free float and independent float for the project given below:

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration	8	7	12	4	10	3	5	10	7	4

3. Draw the network and determine the critical path for the given data:

Jobs	1-2	2-3	3-4	3-7	4-5	4-7	5-6	6-7
Duration	3	4	4	4	2	2	3	2

4. Construct the network for the project whose activities and the 3 time estimates For these activities are given below. Compute

- Expected duration of each activity
- Expected variance of each activity
- Expected variance of each project length

Activity	To	Tm	Tp
1-2	3	4	5
2-3	1	2	3
2-4	2	3	4
3-5	3	4	5
4-5	1	3	5
4-6	3	5	7
5-7	4	5	6

6-7	6	7	8
7-8	2	4	6
7-9	1	2	3
8-10	4	6	8
9-10	3	5	7

UNIT -4

K3 Level

1. For an item the storage cost of one item is Rs.1 per month and the setup cost is RS.25 per run. If the demand is 200n units per month, find the optimum quantity to be produced.
2. The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges 25 % p.a. If the cost of procurement is Rs.150 determine
 - i) EOQ
 - ii) time between two consecutive orders
 - iii) number of orders per year
 - iv) optimal cost.
3. List out the formula EOQ and C1 and C3.
4. A company uses rivets at a rate of 5000 kg per year, rivets costing 2.00 kg. It costs Rs.20 to place an order and carrying cost of inventory is 10 % per year. How frequently should the order for rivets be placed and how much?
5. A company has a demand of 12000 units/year for an item and it can produce 2000 such items per month. The cost of one setup is Rs.400 and the holding cost/unit/month is Rs.0.15. Find the optimum lot size, max inventory, manufacturing time, total time.

K4 and K5 for unit 4

1. The annual demand for an item is 12000 per year and the shortages are allowed. If the unit cost is Rs.15 and the holding cost is Rs.20 per year per unit determine the optimum total yearly cost. The cost of placing one order is Rs.6000 and the cost of one shortage is Rs.100 per year.
2. Find the optimal ordering quantity for the following:

Annual usage	1000 pieces
Cost per piece	Rs.250
Ordering cost	Rs.6 per order
Expediting cost	Rs.4 per order
Inventory holding cost 20% of average inventory	

3. For an item, the production is instantaneous. The storage cost of one item is Rs. 1 per month and the set up cost is Rs.25 per run. If the demand is 200 units per month. Find the optimum quantity to be produced per set up and hence determine the total cost of storage and set up per month.
4. A manufacturer has to supply his customer with 600 units of his products per year. Shortage is not allowed and storage cost amounts to 60 paise per unit per year. The set up cost is Rs.80 find
 - i) The EOQ
 - ii) The minimum average yearly cost.
 - iii) The optimum number of orders per year.
 - iv) The optimum period of supply per order.

K3 level for Unit 5

1. A small industry finds from the past data that the cost of making an item is Rs. 25 the selling price of an item is Rs.30 if it is sold within a week and it could be disposed at Rs. 20 per item at the end of the week.

Weekly sales	≤ 3	4	5	6	7	≥ 8
No. of weeks	0	10	20	40	30	0

Find the optimum number of items per week should the industry produce.

2. The probability distribution of monthly sales of an item is as follows:

Monthly sales	0	1	2	3	4	5	6
Probabilities	.01	.06	.25	.30	.22	.10	.06

The cost of carrying inventory is 30 per unit per month and the cost of unit shortage is Determine optimum stock

3. A milkman buys milk at Rs.2.50 per litre. Unsold milk has to be thrown away. The daily demand has the following probabilities.

Demand	46	48	50	52	54	56	58	60	62	64
probability	.01	.03	.06	.10	.20	.25	.15	.10	.05	.06

How much order should be ordered every day.

4. Examine the criterion for decision making.
5. Analyze about decision tree.

K4 and K5 for unit 5

1. A small industry finds from the past data, that the cost of making an item is Rs.25 the selling price of an item is Rs.30 if it is sold within a week and it could be disposed at Rs.20 per item at the end of the week.

Weekly sales	≤ 3	4	5	6	7	≥ 8
No. of weeks	0	10	20	40	30	0

Find the optimum number of items per week should the industry produce. (OR)

2. A distributor of a certain product incurs holding cost of Rs. 100 per unit per week and shortage cost of Rs.300 per unit. The data on the sales of the product are given below

Weekly sales(units)	0	1	2	3	4	5	6	7	8
No. of weeks frequency	0	0	5	10	15	15	5	0	0

How many units should the distributor buy every week? Also find E.V.P.I.

3. An Automobile Production line turns out about 100 cars a day, but deviators occur owing to many causes. The production is more accurately described by the probability distribution given below:

Production per day	Probability
95	0.03

96	0.05
97	0.07
98	0.10
99	0.15
100	0.20
101	0.15
102	0.10
103	0.07
104	0.05
105	0.03
	1.00

Finished cars are transported across the bay at the end of each day by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped and what will be the average number of empty spaces on the ship?
(Random numbers are 97,02,80,66,96,55,50,29,58,51,04,86,24,39,47)

4. Discuss about simulation and its uses, limitations.