K1 LEVEL

Unit 1

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

   a. Economical b. **Scientific** c. Both A and B d. Artistic

2. Feasible solution satisfies _____

   a. Only constraints b. only non-negative restriction c. **[a] and [b] both**

   d. [a],[b] and Optimum solution

3. 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**

4. Minimize Z = _____

   a. –maximize(Z) b. maximize(-Z) **c. -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 **b. feasible solution** c. basic solution d. optimal

7. Graphical optimal value for Z can be obtained from

   a. Corner points of feasible region b. corner points of the solution region

   c. Both a and c d. none of the above

8. In LPP the condition to be satisfied is

   a. Constraints have to be linear b. Objective function have to be linear

   C. both [a]and [b] D. none of the above

9. The solution to LPP give below is, *Max Z* = 3*x*1 +14*x*2 *subject to* *x*1 - *x*2 ³1, - *x*1 + *x*2 ³ 2 *where* *x*1, *x*2 ³ 0

   a. Unbounded solution b. Max Z = 14 c. Max Z = 3 d**. Infeasible solution**

10. The solution to LPP give below is _____

    1 2 1 2 1 2 1 2 *Max Z* = 30*x* -15*x subject to* 2*x* - 2*x* £ 2, - 2*x* + 2*x* £ 2 *where x* , *x* ³ 0

a. Unbounded solution b. Max Z = 30 c. Max Z = 15 d. Infeasible solution

Unit 2

11. In the definition of LPP m stands for number of constraints and n for number of variables, then which of the following relations hold

    a. m = n b. m ≤ n **c. m ≥ n** d. None of them

12. The linear function of variables which is to be maximized or minimized is called _____

    a. constraints b. basic requirements c. **objective function** d. none of them

13. Operation research approach is _____

    a. **Multi-disciplinary** b. Artificial c. Intuitive d. All of the above

14. 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

15. 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

16. 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

17. In graphical method of linear programming problem if the 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

18. 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

19. The objective function for a L.P model is 3x1+2x2, if x1=20 and x2=30, what is the value of the objective function?

a. 0 b. 50 c. 60 **d. 120**

20. 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

UNIT 3

21. 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

22. 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

23. 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

24. A physical model is an example of

a. An iconic model b. An analogue model c. A verbal model d. A mathematical model

25. 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

26. A model is

a. An essence of reality b. An approximation c. An idealization d. **All of the above**

27. 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**

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

29. In the simplex method the variable enters the basis if _____.

a. $Zj - Cj \geq 0$ b. $Zj - Cj \leq 0$ c. **$Zj - Cj < 0$** d. $Zj - Cj = 0$

30. In the simplex method the variable leaves the basis if the ratio is

a. maximum b. minimum **c. 0** d. none of them

UNIT 4

31. The _____ variable is added to the constraint of less than equal to type.

a. slack b. surplus c. artificial d. basic

32. For the constraint of greater than equal to type we make use of _____ variable.

a. slack **b. surplus** c. artificial d. basic

33. The coefficient of slack variable in the objective function is _____.

a. -M b. +M **c. 0** d. none of them

34. The coefficient of artificial variable in the objective function of maximization problem is _____.

a. -M b. +M c. 0 d. none of them

35. The role of artificial variables in the simplex method is

a. to aid in finding an initial solution

b. to find optimal dual prices in the final simplex table

c. to start with Big M method

d. all of these

36. For a minimization problem, the objective function coefficient for an artificial variable is

a. + M b. -M c. Zero d. None of these

37. For maximization LPP, the simplex method is terminated when all values

a. cj –zj ≤ 0 b. cj –zj ≥ 0 C. cj –zj = 0 d. zj ≤ 0

38. If any value in b - column of final simplex table is negative, then the solution is

a. unbounded **b. infeasible** c. optimal d. None of these

39. To convert ≥ inequality constraints into equality constraints, we must

a. add a surplus variable

b. subtract an artificial variable

c. subtract a surplus variable and an add artificial variable

d. add a surplus variable and subtract an artificial variable

40. In the optimal simplex table cj –zj = 0 value indicates

a. unbounded solution b. cycling **c. alternative solution** d. None of these

UNIT 5

41. At every iteration of simplex method, for minimization problem, a variable in the current basis is replaced with another variable that has

a. a positive cj –zj value **b. a negative cj –zj value** C. cj –zj = 0 d. None of these

42. A variable which does not appear in the basis variable (B) column of simplex table is

a. never equal to zero **b. always equal to zero** c. basic variable D. None of these

43. To formulate a problem for solution by the simplex method, we must add artificial variable to

a. only equality constraints b. only > constraints **c. both A & B** d. None of these

44. If all xij values in the incoming variable column of the simplex table are negative, then

a. solution is unbounded b. multiple solution c. no solution d. None of these

45. If for a given solution, a slack variable is equal to zero, then

a. the solution is optimal b. the solution is infeasible c. there exist no solution

d. None of these

46. Linear programming problem involving more than two variables can be solved by _____

a. Simplex method b. Graphical method c. Matrix minima method d. None of these

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

a. $\Sigma\ ^{1}\Sigma\ i\ j\ a\ b$ b. $\Sigma\ \Sigma$ ij a=b c. m=n d. m+n-1= no. of allocated cell

48. The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that

a. Rim condition should be satisfied b. cost matrix should be square

c. one of the Xij < 0 d. None of them

49. In non-degenerate solution number of allocated cell is_____.

a. Equal to m+n-1 **b. Not equal to m+n-1** c. Equal to m+n+1 d. Not equal to m+n+1

50. From the following methods _____ is a method to obtain initial solution to Transportation Problem.

a. North-West b. Simplex c. Hungarian d. Newton Raphson

K2 LEVEL

UNIT 1

1. Define Operation Research.

   Operations research is defined as the art of winning wars without actually fighting.

2. Note down the applications of operations research.

   Cash flow planning, credit policy planning of delinquent account strategy are some of the areas in Accounting where OR techniques are used.

3. Write down any two scopes of operation research.

   Operations research has solved successfully many cases of research for military, the government and industry. The basic problem in most of the developing countries in Asia and Africa is to remove poverty and hunger as quickly as possible

4. Give any two models of operations research.

   Iconic model and analogue model

5. State phases for formulating the operations research problems.

   Formulation, analysis and interpretation.

6. Give the limitations of operations research.

   Operations research is very costly. This is because OR makes mathematical models for taking decisions and solving problems. OR is not realistic.

7. What is Linear programming problem?

   Linear programming is a technique of finding the optimal value of a linear function of several variables subject to some restrictions. The linear function to be optimized is called the objective function.

8. Write the advantages of LPP.

   Linear programming helps in attaining the optimum use of productive resources. It also indicates how a decision maker can employ his productive factors effectively by selecting and distributing these resources.

9. Write the limitations of LPP

   There should be an objective which should be clearly identifiable and measurable in quantitative terms. The activities to be included should be distinctly identifiable and

measurable in quantitative terms, for instance the products included in a production planning problem and all the activities can't be measured in quantitative terms.

10. Explain the standard form of an LP problem.

Maximize z = c1x1+c2x2+…..cnxn

Subject to constraints,

$a_{11}X_1+a_{12}X_2+…..a_{1n}X_n \leq b1$

$a_{21}x1+a22x_2+…..a_{2n}xn \leq b2$

Where, $x_1, x_2…..x_n \geq 0$

UNIT 2

11. Define LPP in the mathematical form.

The formulation of the problem consists of defining the decision variables, constructing the objective function and writing down the constraints.

12. Write the algorithm to solve LPP using Graphical method for maximization of profit.

Take inequality constraints as equalities. Draw the graph of these constraints. The graph of each constraint is a straight line. To draw the straight line we plot two arbitrary points on the straight line and join these points. Generally the points where the straight line meets x1 and x2 axes are chosen to draw the straight line.

13. Write a note on Basic solution.

Suppose a transportation problem has 'M' rows and 'n' columns. Then a feasible solution to the transportation problem is called a basic solution of the number of allocations is equal to m+n-1 which is one less than the sum of the numbers of rows and number of columns

14. Define Optimum solution.

A solution which optimizes the objective function is called optimal solution.

15. Define feasible solution.

There may be several solutions to the set of variables that satisfy the constraints. These values of the decision variables which satisfy the constraints are called feasible solution.

16. How will you plot inequalities of a LPP?

Take inequality constraints as equalities. Draw the graph of these constraints. The graph of each constraint is a straight line. To draw the straight line we plot two arbitrary points on the straight line and join these points. Generally the points where the straight line meets x1 and x2 axes are chosen to draw the straight line.

17. Define slack variables.

Given a linear programming problem to solve it by simplex method we have to convert the inequality constraints into equality constraints. If an inequality is of the form,< by adding a positive variable, referred to as slack variable to the LHS of the inequality we convert into equality.

18. Define surplus variables.

If an inequality constraints is of the form>, a positive variable is subtracted from the LHS of the constraint to convert into an equality. Such a variable is called a surplus variable

19. Define artificial variables.

Introduction of a surplus variable will not result into a feasible solution. To over come this, we introduce an artificial slack variable into this constraint.

20. When is Big M method useful?

The artificial variable in the LPP will be replaced by real variable leading to optimal solution. In the minimisation problem the high cost is denoted by +M and in maximization the high loss is denoted by –M. this approach of introducing artificial slack variables is called big M method.

UNIT 3

21. What is non degenerate basic feasible solution?

A feasible solution is called a non-degenerate basic feasible solution if it satisfies the following conditions: if the total number of allocations is equal to m+n-1 and the allocations are all independent positions.

22. What is basic feasible solution?

Suppose a transportation problem has m rows and n columns. Then a feasible solution to the transportation problem is called a basic feasible solution, if the number of allocations is equal to m+n-1 which is one less than the sum f the number of rows and the number of columns.

23. State the methods of obtaining initial feasible solution.

North west corner rule, Row minimum method, Column minimum method, Least const entry method, Vogel's Approximation method.

24. What is row minimum method?

In row minimum method we determine allotment row wise. First allotment should be made to the least cost cell in that row.

25. What is column minimum method?

The procedure for obtaining the initial solution by this method is the same as the above method except that allotments are made column-wise instead of row wise

26. What is least cost entry method?

Choose the least cost cell and allot the minimum of availability and requirements corresponding to this cell. Thereby we exhaust the allotment to a row or a column.

27. Expand LCM and RMM.

Least Cost Entry Method and Row Minimum Method

28.

Warehouse/Stores	S1	S2	S3	S4	Availability
W1	X11	X12	X13	X14	A1
W2	X21	X22	X23	X24	A2
W3	X31	X32	X33	X34	A3
Requirement	B1	B2	B3	B4	

Expand CMM and NWC Column Minimum Method and North West Corner rule

29. What is transportation problem?

Consider the problem of transporting goods from various warehouses to different stores. The cost of transportation per unit from the warehouses to different stores, the number of units available at various warehouses and the number of units required by different stores should be given.

30. Write mathematical form of transportation problem.

UNIT 4

31. What is feasible solution in transportation problem?

    A feasible solution to a transportation problem is the set of all non-negative allotments which satisfy the constraints.

32. What do you mean by balanced transportation problem?

    A transportation problem is said to be a balanced transportation problem if the total availability is equal to the total requirement.

33. What is unbalanced transportation problem?

    If the total availability is not equal to the total requirement, it is called unbalanced transportation problem.

34. What is assignment problem.

    Consider the problem of assigning n jobs to n persons such that each job can be assigned to only one person and each person can be allotted only one job. Suppose all the n persons are capable of doing any one the n jobs but the time taken by them to perform the jobs varies from job to job.

35. What is degeneracy in transportation problem?

    In a transportation problem we have seen different methods of obtaining an initial basic solution to the problem. In any case the number of allotted cells cannot exceed m+n-1

36. Expand VAM.

    Vogel's Approximation Method

37. What is unbalanced assignment problem.

    In an assignment problem if the number of persons is less than the number of jobs or the number of jobs is less than the number of persons, the (cij) matrix will not be a square matrix. Such an assignment problem is called an unbalanced assignment problem.

38. Write the other name for VAM.

    VAM is also called as Unit Cost Penalty method.

39. What is restricted assignment problem?

In assignment problems we can also come across situations wherein no assignment can be made in some of the places. Such problems are called restricted assignment problem.

40. What is sequencing problem?

In mathematics we are familiar with the term sequence. Here the order of the occurrence is fixed. The term sequencing is also referred to in this sense in operations research.

UNIT 5

41. Define two types of events used in network analysis.

Critical Path Method and Programming Evaluation and Review Technique.

42. What is free float?

This is the amount of time an activity can be delayed without affecting the commencement of a subsequent activity at its earliest start time, but may affect the float of a previous activity.

43. What is total float?

This is the amount of time a path activities could be delayed without affecting the overall project duration.

44. What is independent float?

This is the amount of time an activity can be delayed when all the preceding activities are completed as late as possible and all subsequent activities are completed as early as possible.

45. Expand CPM.

Critical Path Method

46. Expand PERT.

Programming Evaluation and Review Technique

47. Expand EST and EFT.

Earliest Start Time and Earliest Finish Time

48. Expand LST and LFT.

Latest Start Time and Latest Finish Time

49. What is an inventory?

An inventory may be defined as an idle resource that possesses economic value. It is an item stored or reserved for meeting future demand.

50. What is lead time?

The period of time between ordering the replenishment is called as lead time

K3 LEVEL

UNIT 1

1. A machine producing either product A or B can produce A by using 2 units of chemicals and 1 unit of a compound and can produce B by using 1 unit of chemicals and 2 units of the compound. Only 800 units of chemicals and 1000 units of the compound are available. The profits available per unit of A and B are respectively Rs.30 and Rs.20. draw a suitable diagram to show the feasible region. Also, find the optimum allocation of units between A and B to maximize the total profit. Find the maximum profit.
2. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs.5760 to invest and has space atmost for 20 items. A fan cost him Rs.360 and a sweing machine Rs.240. his expectation is that he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. assuming that he can sell all the items that he can buy, how should he invest this money in order to maximize his profit? Formulate this problem as a linear programming problem and then use graphical method to solve it.
3. A company manufactures 3 types of products which use precious metals, platinum and gold. Due to the shortage of these metals, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements and profits are summarized in the table below:

Product	Platinum Required/unit (gms)	Gold Required/unit (gms)	Profit/Unit (Rs.)
A	2	3	500
B	4	2	600
C	6	4	1200

Daily allotment of platinum and gold is 160 gms and 120 gms respectively. How should the company divide the supply of scarce precious metals? Formulate the mathematical model.

4. A farmer has 1,000 acres of land on which he can grow corn, wheat or soya beans. Each acre of corn costs Rs.100 for preparation, requires 7 man-days of work and yields a profit of

Rs.30. an acre of wheat costs Rs.120 to prepare, requires 10 man days of work and yields a proft of Rs.40. An acre of soyabeans costs Rs.70 to prepare, requires 8 man-days of work and yields a profit of Rs.20. if the farmer has Rs.1,00,000 for preparation and can count on 80,000 man-days work, formulate the mathematical model.

5. Given the restrictions: $x>0$, $y>0$; $2x+y<20$; $x+2y<20$. Indicate the feasible region on a graph and maximize the function $x+3y$.
6. Explain the uses of Operations Research.
7. Explain the advantages and disadvantages of Operations Research
8. State the meaning of Feasible solution, Optimal Solution in LPP.
9. A dietician wishes to mix two types of food in such a way that the vitamin contents of the mixture contains at least 8 units of vitamin A and 10 units of vitamin B. Food 1 contains 2 units per kg of vitamin A and 1 unit per kg of vitamin B while the food II contains 1 unit per kg of Vitamin A and 2 units per kg of vitamin B. it costs Rs.5 per kg to purchase food I and Rs.8 per kg to purchase food II. Prepare a mathematical model of the problem stated above.
10. An agriculturist has a farm with 125 acres. He produce Radish, Muttar and Potato. Whatever he raises is fully sold in the market. He gets Rs. 5 for Radish per kg, Rs.4 for muttar per kg and Rs.5 potato per kg. the average yield is 1500 kg of Radish per acre 1800 kg of muttar per acre and 1200 kg of potato per acre. To produce each 100 kg Radish and Muttar and to produce each 80 kg of potato a sum of Rs.12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man days for Radish and potato each and 5 man days for muttar. A total of 500 man days of labour at a rate of Rs.40 per man day are available. Formulate this as a linear programming model to maximize the agriculturists total profit.

UNIT 2

11. Solve the following transportation problem using Row Minimum Method

	J1	J2	J3	J4	Availability
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	7	19	

12.

	S1	S2	S3	S4	Availability
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	7	19	

Solve the following transportation problem using Column Minimum Method.

13. Examine the procedure for obtaining the initial solution to a transportation problem by North West Corner Rule.

14. Examine the procedure for obtaining the initial solution to a transportation problem by Row Minimum Method.

	A	B	C	Availability
F1	10	9	8	8
F2	10	7	10	7
F3	11	9	7	9
F4	12	14	10	4
Requirement	10	10	8	

15. Examine the procedure for obtaining the initial solution to a transportation problem by Column Minimum Method.

16. Examine the procedure for obtaining the initial solution to a transportation problem by Least Cost Method.

17. Examine the procedure for obtaining the initial solution to a transportation problem by VAM method.

18. Solve the following transportation problem using North west corner rule

	J1	J2	J3	J4	Availability
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	7	19	

19. Solve the following transportation problem using Least Cost Entry Method

	J1	J2	J3	J4	Availability
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	7	19	

20. Solve the following transportation problem using VAM

	1	2	3	4	5
A	16	13	17	19	20
B	14	12	18	16	17
C	14	11	12	17	18
D	5	5	8	8	11
E	5	3	8	8	10

UNIT 3

21. Find the optimal solution for the assignment problem with the following cost matrix.

	W	X	Y	Z
A	11	17	8	16
B	9	7	12	6
C	13	16	15	12
D	14	10	12	11

22. Four operators o1, o2, o3 & o4 are available to a manager to has to get jobs j1,j2,j3& j4 done by assigning one job to each operators .given the times needed by different operators for different jobs in the matrix below.

	J1	J2	J3	J4
O1	12	10	10	8
O2	14	12	15	11
O3	6	10	16	4
O4	8	10	9	7

How should the manager assign the jobs so that the total time needed for all the four jobs in minimum?

23. A project work consist of four major jobs for which four major contractors of submitted tenders the trended documents quoted in thousands of Rs are given with matrix as;

	J1	J2	J3	J4
C1	15	27	35	20
C2	21	29	33	17
C3	17	25	37	15
C4	14	31	39	21

Find the assignment which minimum the total of the project cost each contractor has to be assigned one job.

24. Four jobs can be processed on four different machines. Resulting times in minutes vary with assignments. They are given bellow;

	A	B	C	D
I	42	35	25	21
II	30	25	20	15
III	30	25	20	15
IV	24	20	16	12

25. Five jobs are to be assigned to five person A ,B, C, D & E. The time taken (in minutes) by each of them on each job in given bellow;

JOB	A	B	C	D	E
Machine 1	5	1	9	3	10
Machine 2	2	6	7	8	4

Find the assignment of jobs to each person Hungarian method;

JOB	A	B	C	D	E
Machine 1	4	1	9	3	10
Machine 2	2	5	7	8	6

26. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following jobs on two machines M1 and M2 in the order M1 – M2.

Find also the idle time.

27. Explain unbalanced assignment problem and restricted assignment problem.

28. Solve the following assignment problem.

	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

29. Solve the following assignment problem.

	R1	R2	R3	R4
C1	9	14	19	15
C2	7	17	20	19
C3	9	18	21	18
C4	10	12	18	19
C5	10	15	21	16

30. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following jobs on two machines M1 and M2 in the order M1 – M2.

JOB	A	B	C	D	E
Machine 1	5	1	9	3	10
Machine 2	2	6	7	8	4

UNIT 4

31. The annual demand for an item is 3200units. The unit cost is Rs.6 and inventory carrying charges 25% per annum. If the cost of one precument is Rs.150, determine,

Economic ordering quantity.

No.of orders per year.

Time between two consecutive orders.

The optimal cost.

32. Find the optimal ordering quantity for the following.

1. Annual usage 1000 pieces.
2. Cost per piece Rs.250.
3. The ordering cost Rs.6 per order.
4. Expediting cost Rs.4 per order.
5. Inventory holding of 20% of average inventory.

33. Anil company buys its annual requirements of 36,000 unit in 6 installments. Each unit cost

Rs.25. The inventory carrying cost is estimated at 20% of unit value find the total annual cost of the existing inventory policy. How much money can we saved by using EOQ?

34. A company buys in lots 500 boxes which is a three months supply. The cost per box is Rs.125 and the ordering cost is Rs.150. The inventory carrying cost is estimated at 20% of unit value

1. What is the total annual cost of the existing inventory policy?

2. How much money could be saved by employing EOQ?

35. X Y Z Company Buys in lots of 2000 Units which is only 3 month's supply. The cost per unit is ₹125 and the ordering cost is ₹250. The inventory carrying cost is 20% Of unit value. How much money can be saved by the using Economic Ordering Quantity?

36. If the annual demand is ₹600 units. The storage cost is Rs.0.60 Per year and per unit. and set up cost ₹80 Per run . Find the optimum run size (EOQ).

37.The annual requirement for a product is 3000units. The ordering cost is ₹100 per order. The carrying cost per unit per year is 30% on the unit cost. (a) Find the EOQ. (b) By using better organizational methods, The ordering cost per order is brought down to ₹80 per order, But the same quantity is determined above were orders, what would be the change in total inventory cost? (c) If a new EOQ is found by using the ordered cost as ₹80, what would be further saving in cost?

38.A Manufacturer has to supply its customers with 600units of his product per year. Shortages are not allowed and shortage cost amounts to 60 praise per unit/per year. The set up cost is ₹80. (1) Find EOQ. (2)Minimum Average yearly cost (3)Optimum no.of orders per year (4)The optimum period of supply per optimum. (4)The Optimum period of supply per optimum (5)the increasing the total cost associated with ordering 20% higher than EOQ.

39. The following table gives the activities in construction project and its relevant information.

activity	1-2	1-3	2-3	2-4	3-4	4-5
duration	20	25	10	12	6	10

i. draw the network for the project
ii. find the critical path and the project duration
iii. find the total float for each activity.

40. Draw the network diagram for the following.

job	1-2	1-3	2-3	3-4	4-5
duration	1	2	3	4	5

UNIT 5

41. Draw the network diagram from the given precedence Relationship.

Event no	1	2,3	4	5	6	7
Precedence	Start event	1	2,3	3	4,5	5,6

42. construct the network diagram from the following.

- A is the first operation
- B&C can be performed parallel and are immediate succedors to A
- D,E,F following B
- G follows E
- H follows D, but it can't start till E is completed
- I and J are succedorsto G
- F and J preceed K
- H and I precced L
- M is the succedors to L and K
- The last operation N is the succedors to M and C.

43. Draw the network for the following.

jobs	A	B	C	D	E
Immediate residence	-	-	-	A , b	B , c

44. Explain the types of inventory.
45. Enumerate the reasons for holding stocks.
46. Determine the various inventory control terminologies.
47. Explain the types of control system in EOQ.
48. Explain the various terms in critical path method.
49. Differentiate critical path method and PERT.

50. Explain the three types of time estimates in PERT.

	J1	J2	J3	J4	Availability
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	7	19	