Unit VIII

Operations Research (O.R)

Section –A

One mark questions:

1. Write a scope of Operations Research. (K)

Section – B

Two mark questions

2. Define Operations Research. (U)
3. Write two scope of operations research. (K)
4. Mention two areas where the economic operations research can be applied. (K)

(a) Linear Programming Problem (L.P.P)

Section - A

One mark questions:

5. Define linear programming problem. (U)

6. In L.P.P define decision variables. (U)
7. In L.P.P define objective function. (U)
8. In L.P.P define solution. (U)
9. In L.P.P define feasible solution. (U)
10. In L.P.P define optimal solution. (U)
11. In L.P.P is an optimal solution always a feasible solution? (K)
12. Mention a method of solving Linear Programming Problem. (K)
13. When an L.P.P is said to have unique solution? (K)
14. When an L.P.P is said to have multiple solutions? (K)
15. When an L.P.P is said to have unbounded solution? (K)
16. When an L.P.P is said to have no solution? (K)
17. In graphical method why feasible solution of L.P.P lies in the first quadrant? (K)

Section - B

Two mark questions:

18. Give the general form of L.P.P. in matrix notation. (K)
19. Mention two methods of solving Linear Programming Problem. (K)
20. In which quadrant the feasible solution of the L.P.P lies in graphical method? Give reason. (K)
21. In an L.P.P The objective function is Max Z = 20x + 70y and if feasible solutions are A (0, 8) and B(12 , 5). Find optimal solution. (U)
22. The objective function and two feasible solutions of an L.P.P are Max Z = 200x + 100y and A(0,18), B(12,0). Find the optimal solution. (U)
23. Which of the two feasible solutions (12, 10) and (14, 4) of an L.P.P maximizes the objective function Z = 5x + 4y? (K)
24. Which of the two feasible solutions (10, 12) and (14, 8) of an L.P.P Minimizes the objective function. Min. Z = 10x + 20y? (K)
25. Consider the LPP: Max. Z = 3x + 5y (U)

    s.t. $x + 2y \leq 9$

    $x \leq 3$

    and $x, y \geq 0$

    If x = -1 and y = 5 is a solution to L.P.P. Is it a feasible solution? Give reason.

Section – C/E

Five mark questions:

26. A resourceful home decorator manufactures two types of lamps A and B. Both the lamps go through two technicians, a cutter and a finisher. Lamp A requires two hours of cutter's time and one hour of finisher's time. Lamp B requires one hour of cutter's time and two hours of finisher's time. The cutter has 104 hours and finisher has 76 hours of available time per month. Profit on one lamp of A variety is Rs.10 and B variety is Rs.12. Formulate the L.P.P. (S)
27. A firm can produce two types of cloth say, A and B. Three kinds of wool are required for it, red, green and blue. One unit length of type A cloth needs 2 yards of red wool and 3 yards

of blue wool; one unit length of type B cloth needs 3 yards of red wool, 2 yards of green wool and 1 yard of blue wool. If the firm has a stock of 15 yards of red wool, 8 yards of green wool and 12 yards of blue wool. Profit from unit length of cloth A and B is Rs. 5 and Rs. 8 respectively. Formulate the L.P.P. (S)

28. A small manufacturer employs 5 skilled men and 10 semi-skilled men for making a product in two qualities, a deluxe model and an ordinary model. The production of a deluxe model requires 2 hours of skilled man and 3 hours of semi-skilled man. The ordinary model requires 1 hour of skilled man and 2 hours of semi skilled man. According to worker union rules, no man can work more than 8 hours per day. The profit from each deluxe model is Rs.10 and that from each ordinary model is Rs.8. Formulate a L.P.P such that the total profit is maximised. (S)
29. A tailor gets a profit of Rs.100 from a shirt and Rs.170 from a pant. In a week from available 56 hours, he uses 36 hours for cutting and 20 hours for stitching. For cutting he requires 2 hours for a shirt and 3 hours for a pant. He requires 1 hour for stitching a shirt and 2 hours for stitching a pant. Formulate the L.P.P. (S)
30. A manufacturer produces 2 products , A and B which needs two machines P and Q. Product A requires 6 hours on machine P and 2 hours on machine Q. Product B requires 4 hours on machine P and 4 hours on machine Q. There are 60 hours of time available on machine P and 80 hours on machine Q. Profit earned by the manufacturer on selling one unit of product A is Rs. 20 and one unit of product B is Rs. 12. Formulate the L.P.P. (S)
31. Solve the following L.P.P graphically: (S)

    Max. $Z = 40x + 20y$
    s.t. $2x + 3y \leq 12$
    $x + y \geq 3$
    and $x, y \geq 0$

    OR

    (For visually challenged students only)

    Write the procedure of solving an L.P.P by graphical method.

32. Solve the following L.P.P graphically: (S)

    Min. $Z = 10x + 5y$
    s.t. $4x + 2y \leq 16$
    $2x + 3y \geq 12$
    and $x, y \geq 0$

    OR

    (For visually challenged students only)

    Write down the steps in the graphical method of solving L.P.P.
33. Solve the following L.P.P graphically: (S)

    Max. $Z = 10x + 15y$
    s.t. $x + y \geq 10$
    $3x + 2y \leq 60$
    and $x, y \geq 0$

    OR

    (For visually challenged students only)

    Explain graphical method of solving L.P.P.

34. Solve the following L.P.P graphically: (S)

Max. Z = 3x+5y

s.t. x+2y ≤ 20

y ≤ 6

and x,y ≥ 0

OR

(For visually challenged students only)

Write the procedure of solving an L.P.P by graphical method.

35. Solve the following L.P.P graphically: (S)

Min. Z = 5x + 4y

s.t. 4x + y ≥ 40

2x + 3y ≥ 60

and x , y ≥ 0

OR

(For visually challenged students only)

What is an L.P.P? Explain different kinds of solutions.

36. Solve the following L.P.P graphically: (S)

Max. Z = 3x+5y

s.t. x + y ≤ 150

y ≤ 60

and x, y ≥ 0

OR

(For visually challenged students only)

Explain graphical method of solving L.P.P.

37. Solve the following L.P.P graphically: (S)

Minimize Z = 10x + 5y

Subject to 2x + 3y ≥ 12

4x + 2y ≥ 16

and x ≥0, y ≥ 0

OR

(For visually challenged students only)

Write the procedure of solving an L.P.P by graphical method.

38. Solve the following L.P.P graphically: (S)

Maximize Z = 100x + 170y

Subject to 2x + 3y ≤ 36

x + 2y ≤ 20

and x ≥ 0, y ≥ 0

OR

(For visually challenged students only)

A tailor gets a profit of Rs.100 from a shirt and Rs. 170 from a pant. In a week from available 56 hours, he uses 36 hours for cutting and 20 hours for stitching. For cutting he requires 2 hours for a shirt and 3 hours for a pant. He requires 1 hour for stitching a shirt and 2 hours for stitching a pant. Formulate the L.P.P.

39. Solve the following L.P.P graphically: (S)

Maximize $Z = 20x + 12y$

Subject to $6x + 2y \leq 60$

$4x + 4y \leq 80$

and $x \geq 0,\ y \geq 0$

OR

(For visually challenged students only)

A manufacturer produces 2 products , A and B which needs two machines P and Q. Product A requires 6 hours on machine P and 2 hours on machine Q. Product B requires 4 hours on machine P and 4 hours on machine Q. There are 60 hours of time available on machine P and 80 hours on machine Q. Profit earned by the manufacturer on selling one unit of product A is Rs. 20 and one unit of product B is Rs. 12. Formulate the L.P.P.

(b) Transportation Problem (T.P)

Section - A

One mark questions:

40. In a T.P, define a feasible solution. (U)
41. Define basic feasible solution (BFS) of a T.P. (U)
42. When do you say that a basic feasible solution of T.P is degenerate? (K)
43. When do you say that a basic feasible solution of T.P is non-degenerate? (K)
44. Define optimal solution of a T.P. (U)
45. When T.P is said to be balanced? (K)
46. When a Transportation Problem said to be unbalanced? (K)
47. Write the formula of total cost of T.P. (U)
48. Mention a method of obtaining initial basic feasible solution to a T.P. (K)

Section - B

Two mark questions:

49. Define a transportation problem. (K)
50. What do you mean by degenerate and non-degenerate solutions in T.P? (K)
51. Mention two methods of obtaining initial basic feasible solution for a T.P. (K)
52. Whether the following Transportation problem is balanced? (S)

	D_1	D_2	D_3	Availability
O_1	2	5	2	180
O_2	8	3	7	100
O_3	6	2	10	120
Requirement	150	200	250	

53. Verify whether the following solution to a T.P is non-degenerate. (A)

	D_1	D_2	D_3
O_1	30	10	
O_2		30	
O_3			20

54. Verify whether the following solution to a T.P is non-degenerate. (A)

--	--	30	70
65	--	--	100
--	50	80	---
--	--	30	70

Section-C/E

Five mark questions:

55. Determine an initial basic feasible solution to the following transportation problem by NWCR. Compute the transportation cost. (A)

		To			Supply
		D_1	D_2	D_3	
From	O_1	2	7	4	5
	O_2	3	3	1	8
	O_3	5	4	7	7
	O_4	1	6	2	14
	Demand	7	9	18	

56. Determine an initial basic feasible solution to the following transportation problem by NWCR. Compute the transportation cost. (A)

		To			Supply
		D_1	D_2	D_3	
From	O_1	8	4	12	500
	O_2	10	5	6	200
	O_3	7	5	3	100
	Demand	400	200	200	

57. Obtain an initial B.F.S for the following T.P by NWCR. Find the transportation cost. (U)

		To			Supply
		X	Y	Z	
From	A	10	11	2	27
	B	8	9	6	33
	C	1	7	5	38
	D	3	14	12	22
	Demand	46	44	30	

58. For the following T.P, obtain an initial B.F.S by NWCR and show that it is degenerate. (A)

		Destination				a_i
		A	B	C	D	
Origin	I	3	4	2	6	35
	II	4	3	3	2	50
	III	6	4	7	9	15
	b_j	25	45	15	15	

59. Determine an initial basic feasible solution to the following transportation problem by NWCR. Compute the transportation cost. Is the solution degenerate? (A)

		To			Availability
		X	Y	Z	
From	A	8	7	3	60
	B	3	8	9	70
	C	11	3	5	80
	Requirement	50	80	80	210

60. Obtain an initial basic feasible solution to the following T.P by NWCR. Compute the transportation cost. Is the solution to T.P degenerate? (A)

		Warehouse				Availability
		D_1	D_2	D_3	D_4	
Factory	O_1	19	30	50	10	70
	O_2	70	30	40	60	90
	O_3	40	8	70	20	180
	Requirement	70	80	50	140	

61. Find an initial basic feasible solution by Matrix Minima Method and compute the total transportation cost. Is the solution to T.P non degenerate? (A)

		To			Supply
		D_1	D_2	D_3	
From	O_1	8	4	12	500
	O_2	10	5	6	200
	O_3	7	5	3	100
	Demand	400	200	200	

62. Determine an initial basic feasible solution to the following transportation problem by Matrix Minima Method and compute the transportation cost. (A)

		To			Supply
		D_1	D_2	D_3	
From	O_1	2	7	4	5
	O_2	3	3	1	8
	O_3	5	4	7	7
	O_4	1	6	2	14
	Demand	7	9	18	

63. For the following transportation problem, find the initial basic feasible solution by Matrix Minima Method and obtain the transportation cost. (U)

		Ware house			Availability
		I	II	III	
Factory	A	15	10	9	350
	B	5	8	9	100
	C	10	6	4	110
	Requirement	80	150	330	

64. Obtain an initial basic feasible solution to the following T.P by Matrix Minima Method. Compute the transportation cost. (A)

		To			Supply
		A	B	C	
From	I	7	3	4	2
	II	2	1	3	3
	III	3	4	6	5
	Demand	4	1	5	

65. For the following T.P, find an initial B.F.S by Matrix Minima Method. Obtain the transportation cost. (U)

		Destination				Availability
		D_1	D_2	D_3	D_4	
Origin	O_1	15	14	18	15	300
	O_2	17	19	15	10	250
	O_3	21	25	14	11	150
	Requirement	100	200	150	250	

(c) Game Theory

Section - A

One mark questions:

66. Write a property of a competitive game. (K)
67. What is n-person game? (K)
68. What is two-person game? (K)
69. What do you mean by zero-sum game? (K)
70. Define rectangular game. (U)
71. Define strategy in a game. (U)
72. What do you mean by pure strategy in a game? (K)
73. What do you mean by a mixed strategy in a game? (K)
74. In a rectangular game, what is meant by pay-off matrix? (K)
75. What is meant by maximin of a game? (K)
76. What is meant by minimax of a game? (K)
77. What is a saddle point? (K)
78. When do you say that a game has saddle point? (K)
79. What do you mean by the value of a game? (K)
80. When the game is said to be fair? (K)
81. If value of the game is -6, is the game fair? (K)
82. In a rectangular game, if gain of a player is Rs.3 then what is the loss of the other? (K)
83. If in a game the pay-off at saddle point is 4, what is the value of minimax? (K)
84. Mention a method of solving a rectangular game. (K)

Section - B

Two mark questions:

85. Write two properties of a competitive game. (K)
86. What are pure and mixed strategies in a game? (K)
87. Explain maximin and minimax of a game. (U)
88. What is a saddle point? When do you say that a game has saddle point? (K)
89. What do you mean by the value of a game? When the game is fair? (K)
90. Mention two methods of solving a rectangular game. (K)
91. In a rectangular game the pay-off matrix of player A is given below. Write down the pay-off matrix of player B. (A)

$$\begin{array}{cc} & \text{Player B} \\ & \begin{matrix} B_1 & B_2 & B_3 & B_4 \end{matrix} \\ \text{Player A} \begin{matrix} A_1 \\ A_2 \end{matrix} & \begin{pmatrix} 5 & 3 & 8 & -6 \\ 5 & 10 & -3 & -6 \end{pmatrix} \end{array}$$

92. For the following pay-off matrix of player B, write down the pay-off matrix of player A. (K)

$$\begin{array}{cc} & \text{Player A} \\ & \begin{matrix} A_1 & A_2 & A_3 \end{matrix} \\ \text{Player B} \begin{matrix} B_1 \\ B_2 \end{matrix} & \begin{pmatrix} 1 & -3 & 5 \\ 2 & -4 & 6 \end{pmatrix} \end{array}$$

93. The following is the pay off matrix of player A. Write the pay-off matrix of player B. (K)

$$\begin{array}{cc} & \text{Player B} \\ & \begin{matrix} B_1 & B_2 \end{matrix} \\ \text{Player A} \begin{matrix} A_1 \\ A_2 \\ A_3 \end{matrix} & \begin{pmatrix} 3 & 2 \\ 5 & 4 \\ 0 & -1 \end{pmatrix} \end{array}$$

94. Using maximin-minimax principle, find the value of game. (U)

$$\begin{array}{cc} & \text{Player B} \\ & \begin{matrix} B_1 & B_2 \end{matrix} \\ \text{Player A} \begin{matrix} A_1 \\ A_2 \end{matrix} & \begin{pmatrix} 8 & 5 \\ 3 & 2 \end{pmatrix} \end{array}$$

Section – C/E

Five marks questions:

95. Two players A and B play a game of tossing coins. If the coins match, then A gets Rs.5 from B and if the coins do not match, B gets Rs.10 from A. Write down the pay off matrix of A. Does the game have saddle point? (U)
96. Players A and B play a game in which each player has 3 coins (Re.1, Rs.5, Rs.10). Each of them selects a coin without the knowledge of the other. If the sum of values of the coins is an even number, A wins B's coin otherwise B wins A's coin. Write down the pay off matrix of A. Does the game have saddle point? (U)

97. For the following pay-off matrix, find the solution using maximin-minimax principle. (U)

Player B

Player A	B_1	B_2	B_3	B_4
A_1	10	8	6	20
A_2	20	12	7	9
A_3	3	2	3	2

98. Solve the following game using maximin-minimax principle. Is the game fair? (A)

Company - Y

Company - X	P	Q	R
A	3	-1	3
B	2	-1	2
C	-1	0	0
D	2	0	4

99. Pay-off matrix of player A is as follows. Find the solution by maximin-minimax principle. (U)

Player B

Player A	B_1	B_2	B_3	B_4
A_1	−7	0	3	−5
A_2	7	−2	0	−5
A_3	−2	−1	−2	0
A_4	4	2	3	6

100. Solve the following game using maximin-minimax principle. (A)

Player B

Player A	B_1	B_2	B_3
A_1	1	3	1
A_2	0	−1	−3
A_3	1	5	−1

101. Solve the following game using dominance principle. (A)

Player B

Player A	B_1	B_2	B_3	B_4
A_1	5	2	1	6
A_2	2	1	0	2
A_3	7	5	4	5

102. For the following pay-off matrix, find the solution using dominance principle. Is the game fair? (S)

Player B

Player A	B_1	B_2	B_3	B_4
A_1	4	2	0	5
A_2	−1	−2	0	−3
A_3	−3	1	−3	0

103. Solve the following game using the principle of dominance. (A)

$$\begin{array}{cc} & \text{Player B} \\ & \begin{array}{cccc} B_1 & B_2 & B_3 & B_4 \end{array} \\ \text{Player A} & \begin{pmatrix} A_1 & 1 & 2 & 0 & 3 \\ A_2 & 4 & 6 & 3 & 5 \\ A_3 & 3 & -1 & -2 & 0 \end{pmatrix} \end{array}$$

104. Solve the following game by dominance principle. (S)

$$\begin{array}{cc} & \text{Player B} \\ & \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \text{Player A} & \begin{pmatrix} A_1 & 6 & 12 & 7 \\ A_2 & 7 & 9 & 8 \\ A_3 & 5 & 8 & 9 \\ A_4 & 3 & 6 & 10 \end{pmatrix} \end{array}$$

(d) Replacement Theory

Section - A

One mark questions:

105. What do you mean by replacement theory? (K)
106. Mention a need for replacement of equipment. (K)
107. When do you suggest for replacement of equipment which deteriorates with age? (K)
108. Write the formula of to-date average annual cost. (U)

Section - B

Two mark questions:

109. Mention two needs for replacement of equipments. (K)
110. If the depreciation cost and the cumulative maintenance cost of an equipment for the third year are Rs.10,000 and Rs.10,400 respectively. What is the average annual cost? (K)
111. If the depreciation cost and the cumulative maintenance cost of an equipment for the second year are Rs.10,000 and Rs.10,200 respectively. What is the average annual cost? (K)
112. For an equipment the fourth year depreciation cost is Rs.6,000 and the cumulative maintenance cost is Rs.6,200. Find the average annual cost. (K)

Section – C/E

Five mark questions:

113. The cost of a scooter is Rs 36,000. Its maintenance cost and resale value at different age are given below:

Year	1	2	3	4	5	6
Maintenance cost (Rs.)	800	1,300	1,900	2,700	3,900	5,400
Resale value (Rs.)	28,000	22,000	20,000	18,000	17,000	16,000

Determine the optimal age for replacement of the scooter. (A)

114. The purchase price of a machine is Rs 10,000. Its maintenance costs and resale values are as below:

Year	1	2	3	4	5
Maintenance cost (Rs.)	600	800	1,000	1,400	2,000
Resale value (Rs.)	5,600	4,000	3,000	2,000	1,000

What would be the optimum replacement period of machine? What would be the average annual cost? (K)

115. The purchase price of a machine is Rs 8,000. Its maintenance costs and resale values are given below:

Year	1	2	3	4	5
Maintenance cost (Rs.)	500	600	800	1,100	1,500
Resale value (Rs.)	4,500	3,500	2,500	1,500	500

What would be the optimum replacement period of machine? What would be the average annual cost? (K)

116. Purchase cost of an item is Rs.5,000. Its running costs and resale values in different years are as follows:

Year	1	2	3	4	5
Running cost (Rs.)	100	200	330	510	860
Resale value (Rs.)	3,000	2,500	2,000	1,500	1,000

Find the optimum replacement period of item. (U)

117. The following are the maintenance and depreciation costs per year of a vehicle.

Year	1	2	3	4	5	6	7
Depreciation cost (Rs.)	18,000	33,000	40,500	44,250	46,000	46,000	46,000
Maintenance cost (Rs.)	4,500	5,500	6,500	8,500	11,000	15,500	17,500

When the vehicle should be replaced? (K)

118. The following are the maintenance and depreciation costs per year of a vehicle.

Year	1	2	3	4	5	6	7
Depreciation cost (Rs.)	20,000	35,000	42,500	46,250	48,000	48,000	48,000
Maintenance cost (Rs.)	5,000	6,000	7,000	9,000	11,500	16,000	18,500

When the vehicle should be replaced? (K)

119. The cost of a machine is Rs.6600 and its resale value is Rs.600. The maintenance costs in different years are as follows:

Year	1	2	3	4	5	6	7
Maintenance cost (Rs.)	250	300	450	600	900	1500	1800

Find the annual average cost. What is the optimum period of replacement? (K)

120. Price of an item is Rs. 1000 and its maintenance costs at different years are as follows:

Year	1	2	3	4	5
Maintenance cost (Rs.)	100	200	350	650	900

Assuming that resale value is negligible, find the annual average cost. What is the optimum period of replacement? (K)

121. A machine costs Rs.36000 and the operating cost is estimated to be Rs.1500 for the first year and increases by Rs.3000 every year for next 5 years. Determine the optimum period for replacement of the machine, assuming that the machine has no resale value. (A)
122. Equipment costs Rs. 5000, the running cost is Rs. 500 for the first two years and increases by Rs. 2000 from third year onwards. The scrap cost of the machine at all times is Rs. 300. Find the optimal replacement period. (U)
123. Machine is priced Rs.6000 and operating cost is Rs.800 each for the first five years, increases by Rs.200 per year in the sixth and subsequent years. Determine the best age to replace the machine. Assume that the machine has no resale value. (A)

(e) Inventory Theory

Section - A

One mark questions:

124. What do you mean by inventory? (K)
125. Mention one objective of inventory. (K)
126. In inventory, what is holding cost? (K)
127. In inventory, what do you mean by set-up cost? (K)
128. In inventory, what do you mean by ordering cost? (K)
129. In inventory, what do you mean by shortage cost? (K)
130. In inventory, what is capital cost? (K)
131. Mention a type of variable associated with inventory. (K)
132. What is meant by stock replenishment in inventory? (K)
133. Define uniform demand in inventory. (U)
134. In inventory, what is lead time? (K)
135. What is E.O.Q? (K)
136. What is E.L.S? (K)
137. Mention an advantage of inventory. (K)
138. Write a disadvantage of inventory. (K)
139. Mention a category of inventory model. (K)

Section - B

Two mark questions:

140. Mention two types of costs associated with inventory. (K)
141. Mention two advantages of inventory. (K)
142. State the assumptions of E.O.Q Model –I. (K)
143. State the assumptions of E.O.Q Model –II. (K)
144. Given, R = 3600 units/year, C_3 = Rs.50/cycle and C_1 = Rs.4/unit/year, find Q^0. (U)
145. Calculate E.O.Q when R = 5000 units/year, C_1 = Rs.2/unit/year, C_3 = Rs.200/cycle. (A)
146. If R =100 units/month, C_3 = Rs.250/cycle and C_1 = Rs.0.20/unit/month. Find Q^0. (U)
147. Given, R = 5000 items/year, C_3 = Rs. 50/cycle, C_1 = Rs.2/item/year. Calculate minimum average inventory cost. (A)

Section - C

Five mark questions:

148. Given, Demand = 5000 items/year, Holding cost= Rs.2/item/year, Setup cost = Rs.50/cycle. Calculate i) E.O.Q ii) minimum average inventory cost. (A)
149. There is a demand for 3600 units/year. The cost of placing an order is Rs. 50. Maintenance cost is Rs.9/unit/year. Find (i) E.O.Q (ii) Minimum average inventory cost. (U)
150. If R = 12000 units/year, C_1 = Rs.0.3/unit/month, C_3 = Rs.150/run. Find (i) optimum lot size (ii) minimum average annual inventory. (U)
151. There is a demand for 10000 items per year. The replenishment cost is Rs.200 and the maintenance cost is Rs.9 per item per year. Replenishment is instantaneous and shortages are not allowed. Find economic order quantity and minimum average inventory cost. (U)
152. A manufacturer has to supply 12,000 units of a product per year to a customer. The inventory holding cost is Rs. 2 per unit per year and the set up cost per run is Rs. 750. Determine (i) the optimum lot size (ii) re-order time. (A)
153. A stockist has to supply 300 units of a product every month to his customers. He gets the product at Rs.50 per unit from the manufacturer. The cost of carrying inventory is 12% per year of the cost of the product. The ordering cost is Rs.75/- per order. Find (i) EOQ and (ii) re-order frequency. (U)
154. The annual demand for an item is 3000 units. Capital cost is Rs. 10 per unit. Inventory carrying cost is 20% of capital cost per annum. If setup cost is Rs.75, Find (i) EOQ (ii) re-order time. (U)
155. Maruthi Udyog Company purchases 10,000 rear mirrors for cars annually. The ordering cost per order is Rs. 12. Each mirror costs Rs. 50 and the annual inventory carrying cost is 12% of capital cost. Compute EOQ and the minimum average inventory cost. (A)
156. The demand for a commodity is at a constant rate of 200 units per year. There is an inventory in which setup cost is Rs. 800 per production run, holding cost is Rs.10 per unit per year and shortage cost is Rs. 12 per unit per year. Find the economic order quantity and maximum shortage level. (U)
157. The demand for an item is 700 units per year. The cost of placing an order is Rs.7 and holding cost is Rs. 2 per unit per year. The shortage cost is Rs. 3 per unit per year. Find (i) EOQ (ii) maximum inventory level. (U)
158. The following data gives various costs and other factors for the production of inventory systems of gears:
    Demand = 10000 gears / year
    Setup cost = Rs.180 / setup
    Holding cost = Rs. 40 / gear / year
    Shortage cost = Rs.100 / gear / year
    Find minimum average annual inventory cost. (U)
159. The annual demand of an item is 3600 units. The cost of placing an order is Rs.50 and annual maintenance cost is Rs. 9 per unit. The annual shortage cost is Rs. 16 per unit. Find (i) EOQ (ii) maximum inventory level. (U)
160. The annual demand of an item is 8100 units. The cost of placing an order is Rs. 150 and annual maintenance cost is Rs. 3 per unit. The annual shortage cost is Rs. 9 per unit. Find (i) EOQ (ii) maximum shortage level. (S)

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