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20MCM334

Third Semester M.Tech. Degree Examination, Feb./Mar. 2022

## Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. A Pension Fund Manager is considering investing in 2 shares A & B. It is estimated that
- Share A will earn a dividend of 12% P.a and share B 4% P.a.
  - Growth in the market value in one year of Share A will be 10 Paise per Re. 1 invested and in B, 40 Paise per Re. 1 invested.
- He requires to invest the maximum total sum which will give
- Dividend income of atleast Rs 600 per annum.
  - Growth in one year of atleast Rs 1000 on the initial investment.
- Formulate this problem as LP model to compute the minimum sum in order to be invested to meet the Manager's Objective. (10 Marks)
- b. What are the application areas of Linear Programming? (10 Marks)

OR

- 2 a. Use Simplex method to solve  
Max.  $Z = 3x_1 + 5x_2$ .  
Subject to  $3x_1 + 2x_2 \leq 18$   
 $x_1 \leq 4$  ;  $x_2 \leq 6$  ;  $x_1, x_2 \geq 0$ .  
Discuss the change in  $C_j$  on the Optimality of the optimal basic feasible solution. (12 Marks)
- b. Explain the factors involved in Inventory Problem Analysis. (08 Marks)

### Module-2

- 3 a. Solve by Graphical method :  
Max.  $Z = 50x_1 + 30x_2$   
Subject to  $2x_1 + x_2 \geq 18$   
 $x_1 + x_2 \geq 12$   
 $3x_1 + 2x_2 \leq 34$   
 $x_1, x_2 \geq 0$ . (10 Marks)
- b. Explain the Simplex Algorithm for maximization. Briefly explain all the steps involved. (10 Marks)

OR

- 4 a. Solve by Dual – Simplex method.  
Max.  $Z = -3x_1 - 2x_2$   
Subject to  $x_1 + x_2 \geq 1$   
 $x_1 + x_2 \leq 7$   
 $x_1 + 2x_2 \geq 10$   
 $x_2 \leq 3$  ;  $x_1, x_2 \geq 0$ . (10 Marks)
- b. Consider the LPP  
Max.  $Z = 3x_1 + 2x_2 + 5x_3$   
Subject to  $x_1 + 2x_2 + x_3 \leq 430 + \lambda$   
 $3x_1 + 2x_3 \leq 460 - 4\lambda$   
 $x_1 + 4x_2 \leq 420 - 4\lambda$   
 $x_1, x_2, x_3 \geq 0$ . Find the critical range of  $\lambda$  for Optimal feasible solution. (10 Marks)

**Module-3**

- 5 a. Explain Kuhn – Tucker necessary and sufficient conditions in NLP. (10 Marks)  
 b. Solve graphically  
 Max.  $Z = 2x_1 + 3x_2$   
 Subject to  $x_1^2 + x_2^2 \leq 20$   
 $x_1, x_2 \leq 8$   
 $x_1, x_2 \geq 0$ . (10 Marks)

**OR**

- 6 a. What are the phases of Project Management? Explain with the help of a diagram. (10 Marks)  
 b. Explain different steps in Time – Cost Trade – Off procedure. (10 Marks)

**Module-4**

- 7 a. A Supermarket has 2 sales-girls at the sales counters. If the service time for each customer is exponential with a mean of 4 min. and if the people arrive in a Poisson fashion at the rate of 10 an hour, calculate i) Probability that a customer has to wait.  
 ii) Expected % of idle time for each sales girl.  
 iii) Expected length of waiting time. (10 Marks)  
 b. Explain the reasons for carrying inventory. (10 Marks)

**OR**

- 8 a. Explain Marginal Analysis approach in probabilistic Inventory control models. (10 Marks)  
 b. Explain necessary conditions for Optimality in Geometric programming. (10 Marks)

**Module-5**

- 9 a. Write a note on Terminology and Assumptions used in Sequencing models. (10 Marks)  
 b. Use Dynamic programming to solve the following problem  
 Minimize  $Z = y_1^2 + y_2^2 + y_3^2$   
 Subject to  $y_1 + y_2 + y_3 \geq 15$   
 $y_1, y_2, y_3 \geq 0$ . (10 Marks)

**OR**

- 10 a. What are the types of Simulation? Briefly explain. (10 Marks)  
 b. With the help of a block diagram, explain the steps in Simulation Process. (10 Marks)

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