**POORNIMA UNIVERSITY, JAIPUR**

**END SEMESTER EXAMINATION, November 2022**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **4BT7135** | Roll No. | Total Printed Pages: 2 |
| **4BT7135** |  |
| B. Tech. IV Year VII-Semester (Main) End Semester Examination, November 2022  **(CE)** | |
| **BCE07101 : Operation Research** | | | |

# Time: **3** Hours. Total Marks: **60**

Min. Passing Marks: **21**

Attempt **five** questions selecting one question from each Unit. There is an internal choice from Unit I to Unit V. Marks of each question or its parts are indicated against each question/part. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Use of the following supporting material is permitted during the examination for this subject.

# **1.--------------------------Nil--------------------** **2.------------------Nil-----------------------**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **UNIT-I (CO1)** | **Marks** | **Bloom Level** |
| **Q.1** | **(a)** | Define the term Linear Programming Problem (LPP). List out various characteristics of LPP. Explain the LPP Model with various forms using a suitable example. | **(6)** | **Knowledge** |
|  |  |  |  |  |
|  | **(b)** | Explain the graphical solutions of two variables Linear Programming Problem (LPP) using a suitable example. | **(6)** | **Apply** |
|  |  | **OR** |  |  |
| **Q.2** | **(a)** | A small enterprise produces two types of leather belts X and Y. The respective profits are Rs. 40 and Rs. 20 per piece. The supply of raw materials is sufficient for making 800 products per day. The availability of buckles for belt X is 450 and that for belt Y is 650 per day. Each belt X needs twice as much time as that required for belt Y and the enterprise can produce 500 belts per day if all of them were of type X. Formulate the problem as a linear programming problem to maximize the profit per day. | **(6)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | Explain how to solve a problem using the model in Operation Research. Define the terms problem formation, constructing a model, solving mathematical models, and implementation. Give various application areas. | **(6)** | **Understanding** |
|  |  | **UNIT-II (CO2)** |  |  |
| **Q.3** | **(a)** | Define the conditions for a minimum or a maximum value of a function of several variables. Elaborate using a suitable example. | **(6)** | **Analyse** |
|  |  |  |  |  |
|  | **(b)** | What do you mean by Convex and No-convex programming problems? Define the terms convex optimization problems, convex functions, and convex set through examples. | **(6)** | **Knowledge** |
|  |  | **OR** |  |  |
| **Q.4** | **(a)** | What does it mean to Use First and Second Order Conditions? Explain with a suitable example. Also, distinguish between Local vs. Global Maxima / Minima. | **(6)** | **Understanding** |
|  |  |  |  |  |
|  | **(b)** | Explain the term Constrained Optimisation in different forms. With help of a suitable example, explain Constrained Optimisation using Kuhn-Tucker conditions. | **(6)** | **Apply** |
|  |  | **UNIT-III (CO3)** |  |  |
| **Q.5** | **(a)** | Give a suitable example to demonstrate the simplex technique's requirement that the slack, surplus, and artificial variables all be non-negative. | **(6)** | **Analyse** |
|  |  |  |  |  |
|  | **(b)** | What do you mean by the primal and dual problem? Explain the relationship between primal and dual problems. | **(6)** | **Knowledge** |
|  |  | **OR** |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Q.6** | **(a)** | Define the term Simplex Algorithm. Give an appropriate example while classifying the Simplex Algorithm in tabular form. | **(6)** | **Analyse** |
|  |  |  |  |  |
|  | **(b)** | Setup the dual problem and solve using the simplex method:  Minimize A = 3x + 4y subject to x + y ≥ 5, 2x + y ≥ 6, x ≥ 0, y ≥ 0 | **(6)** | **Apply** |
|  |  | **UNIT-IV (CO4)** |  |  |
| **Q.7** | **(a)** | With help of suitable examples describe all three models (transportation, assignment, and transshipment models). | **(6)** | **Analyse** |
|  |  |  |  |  |
|  | **(b)** | A contractor pays his subcontractors a fixed fee plus mileage for work performed. On a given day the contractor is faced with three electrical jobs associated with various projects. In the table given below, there are the distances between the subcontractors and the projects. How should the contractors be assigned to minimize total costs?   |  |  |  |  | | --- | --- | --- | --- | |  | Projects | | | |  | A | B | C | | Subcontractors - 1 | 50 | 36 | 16 | | Subcontractors - 2 | 28 | 30 | 18 | | Subcontractors - 3 | 35 | 32 | 20 | | Subcontractors - 4 | 25 | 25 | 14 | | **(6)** | **Evaluate** |
|  |  | **OR** |  |  |
| **Q.8** | **(a)** | Jaipur Bricks Company (JBC) has orders for 80 tonnes of bricks at three suburban locations as follows: Jagatpura = 25 tonnes, Pratap Nagar = 45 tonnes, and Saket = 10 tonnes. JBC has two plants, each of which can produce 50 tonnes per week. How should the end-of-week shipments be made to fill the above orders given the following delivery cost per tonne:   |  |  |  |  | | --- | --- | --- | --- | |  | Jagatpura | Pratap Nagar | Saket | | Plant 1 | 24 | 30 | 40 | | Plant 2 | 30 | 40 | 42 | | **(6)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | What type of approach might be taken to determine how to travel between cities while cutting down on the overall distance covered? Give a justification for your explanation. | **(6)** | **Analyse** |
|  |  | **UNIT V (CO5)** |  |  |
| **Q.9** | **(a)** | Define the following terms:   1. Shapley Value 2. Constant-sum and non-constant-sum games 3. Dominance and Dominance Principle | **(6)** | **Knowledge** |
|  |  |  |  |  |
|  | **(b)** | For the given table provided:   1. What strict domination eliminations can we do? 2. What would you predict the players of this game would do?  |  |  |  |  | | --- | --- | --- | --- | |  | I | II | III | | I | 0,4 | 4,0 | 5,3 | | II | 4,0 | 0,4 | 5,3 | | III | 3,5 | 3,5 | 6,6 | | **(6)** | **Evaluate** |
|  |  | **OR** |  |  |
| **Q.10** | **(a)** | What do you mean by Zero-Sum Game? Define the Characteristics of Game Theory. What are the different applications of game theory? | **(6)** | **Understanding** |
|  |  |  |  |  |
|  | **(b)** | Playing mind games: If you are player 1, which strategy should you play?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  | Player-2 | | | |  |  | X | Y | Z | | Player-1 | A | 3,3 | 0,5 | 0,4 | | B | 0,0 | 3,1 | 1,2 | | **(6)** | **Evaluate** |