**POORNIMA UNIVERSITY, JAIPUR.**

**END SEMESTER EXAMINATION, April 2023**

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|  | **4BT2105** | Roll No. | Total Printed Pages: 2 |
| **4BT2105** |  |
| B. Tech. II Year IV-Semester (Back) End Semester Examination, April 2023  **(AI)** | |
| **BDS04108 / BAI04109: Optimization Techniques** | | | |

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

Min. Passing Marks: **21**

Attempt **five** questions selecting one question from each Unit. There is internal choice from Unit I to Unit V. Marks of each question or its parts are indicated against each question / parts. 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 following supporting material is permitted during examination for this subject.

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

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|  |  | **UNIT-I (CO1)** | **Marks** | **Bloom Level** |
| **Q.1** | **(a)** | Write the terminology used in Linear Programming. | **(6)** |  |
|  | **(b)** | A company produces two types of pen, say A and B. Pen A is a superior quality and Pen B is a lower quality. Profit on pens A and B are Rs.5 and Rs.3 per pen respectively. Raw material required for each pen A is twice as that for pen B. The supply of raw materials is sufficient only for 1000 pens of type B per day. Pen A requires a special clip and only 400 such clips are available per day. For pen B, only 700 clips are available per day. Find graphically the product-mix so that the company can make maximum profit. | **(6)** |  |
|  |  | **OR** |  |  |
| **Q.2** | **(a)** | What is the importance of Linear Programming? | **(6)** |  |
|  | **(b)** | A firm, manufacturing two types of electrical items, A and B, can make a profit of Rs.20 per unit of A and Rs.30 per unit of B. Each unit of A requires 3 motors and 2 transformers and each unit of B requires 2 motors and 4 transformers. The total supply of these per month is restricted to 210 motors and 300 transformers. Type B is an export model requiring a voltage stabilizer, which has a supply restricted to 65 units per month. Formulate the linear programming problem for maximum profit and solve it graphically. | **(6)** |  |
|  |  | **UNIT-II (CO2)** |  |  |
| **Q.3** | **(a)** | Determine the value of x for which the function  assume the optimum value. | **(6)** |  |
|  | **(b)** | A given quantity of metal is to be cast into half cylinder, i.e., with a rectangular base and semi-circular ends. Show that, in order that the total surface area may be a minimum, the ratio of the length of the cylinder to the diameter of its semi-circular ends is π / (π+2). | **(6)** |  |
|  |  | **OR** |  |  |
| **Q.4** | **(a)** | Solve the following problem using Kuhn-Tucker conditions: | **(6)** |  |
|  | **(b)** | Find the stationary value of | **(6)** |  |
|  |  | **UNIT-III (CO3)** |  |  |
| **Q.5** | **(a)** | Solve the following LPP: | **(6)** |  |
|  |  |  |  |  |
|  | **(b)** | Use two phase simplex method to solve the following LPP: | **(6)** |  |
|  |  | **OR** |  |  |
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| **Q.6** | **(a)** | Solve the LPP by using Big-M method: | **(6)** |  |
|  | **(b)** | Write the dual of the problem | **(6)** |  |
|  |  | **UNIT-IV (CO4)** |  |  |
| **Q.7** | **(a)** | Solve the following transportation problem by VAM.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Origin | Destination | | | | | Supply | | W1 | W2 | W3 | W4 | W5 | | F1 | 20 | 28 | 32 | 55 | 70 | 50 | | F2 | 48 | 36 | 40 | 44 | 25 | 100 | | F3 | 35 | 55 | 22 | 45 | 48 | 150 | | Demand | 100 | 70 | 50 | 40 | 40 | 300 | | **(6)** |  |
|  | **(b)** | Construct network and find the Critical Path:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | A | B | C | D | E | F | G | H | I | | Nodes | 1-2 | 1-3 | 1-4 | 2-3 | 2-6 | 3-5 | 3-6 | 4-5 | 5-6 | | Time in Weeks | 3 | 4 | 14 | 10 | 5 | 4 | 6 | 1 | 1 | | **(6)** |  |
|  |  | **OR** |  |  |
| **Q.8** | **(a)** | The time estimates (in weeks) for the activities of a PERT network are given below:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 4-6 | 5-6 | | t­o | 1 | 1 | 2 | 1 | 2 | 2 | 3 | | tm | 1 | 4 | 2 | 1 | 5 | 5 | 6 | | tp | 7 | 7 | 8 | 1 | 14 | 8 | 15 |   (a) Draw the project network and identify all the paths through it.  (b) Calculate the standard deviation and variance of the project length.  (c) The probability that the project will be completed on schedule if the scheduled completion time is 20 weeks. | **(6)** |  |
|  | **(b)** | Four salesmen A, B, C, D and four different cities Delhi, Mumbai, Jaipur, Kolkata. Sales in 1000 is given below. Find out maximum sales by assigning different city to different salesman.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Cities | Salesman | | | | | A | B | C | D | | Delhi | 60 | 40 | 60 | 70 | | Mumbai | 20 | 60 | 50 | 70 | | Jaipur | 20 | 30 | 40 | 60 | | Kolkata | 30 | 10 | 30 | 40 | | **(6)** |  |
|  |  | **UNITV (CO5)** |  |  |
| **Q.9** | **(a)** | A and B play a game in which each has three coins: a penny, a nickel and a dime. The penny is worth Rs.1, nickel Rs.2 and dime Rs.3. Each selects a coin without the knowledge of the other’s choice. If the sum of the coins is and odd amount, A wins B’s coin; if the sum is even, B wins A’s coin. Find the best strategy for each player and the value of the game. | **(6)** |  |
|  | **(b)** | Solve the game whose pay-off matrix is represented as:   |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | -2 | 15 | -2 | | A2 | 5 | 6 | 4 | | A3 | -6 | -2 | -6 | | **(6)** |  |
|  |  | OR |  |  |
| **Q.10** | **(a)** | Solve the following game:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Player A | Player B | | | | | | | |  | I | II | III | IV | V | VI | | I | 4 | 2 | 0 | 2 | 1 | 1 | | II | 4 | 3 | 1 | 3 | 2 | 2 | | III | 4 | 3 | 7 | -5 | 1 | 2 | | IV | 4 | 3 | 4 | -1 | 2 | 2 | | V | 4 | 3 | 3 | -2 | 2 | 2 | | **(6)** |  |
|  | **(b)** | Solve the following 3x2 game:   |  |  |  |  | | --- | --- | --- | --- | | Player X | Player Y | | | | X1 | -2 | 5 | | X2 | -5 | 3 | | X3 | 1 | -4 | | **(6)** |  |