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# PRESIDENCY UNIVERSITY BENGALURU

**SCHOOL OF MANAGEMENT**

**MAKE-UP EXAMINATION - SEP 2023**

**Course Code :** MBA3044

**Course Name :** Sem IV - MBA3044 - Operations Research

**Program :** MBA

**Date :** 3-OCT-2023

**Time :** 1.00PM - 4.00PM

## Max Marks : 100

**Weightage :** 50%

**Instructions:**

### Read all questions carefully and answer accordingly.

1. *Question paper consists of 3 parts.*
2. *Scientific and non-programmable calculator are permitted.*
3. *Do not write any information on the question paper other than Roll Number.*

#### Part A [Memory Recall Questions]

**Answer all the Questions. Each question carries Five marks (6Q X 5M =30M)**

1. Define a Linear Programming Problem.
2. Define a feasible solution to an LPP

(CO1) [Knowledge] (CO1) [Knowledge]

1. With the help of an example, identify the objective function, decision variables and the constraints.

(CO1) [Knowledge]

1. Write the Standard form of LPP.

(CO1) [Knowledge]

1. Determine an initial basic feasible solution to the following transportation problem by using North West corner Rule.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Destination |  | | | | | |
|  |  | D1 | D2 | D3 | D4 | Supply |  |
| Origin | O1 | 6 | 4 | 1 | 5 | **14** |  |
|  | O2 | 8 | 9 | 2 | 7 | **16** |  |
|  | O3 | 4 | 3 | 6 | 2 | **5** |  |
|  | Demand | **6** | **10** | **15** | **4** | **35** |  |
|  |  |  |  |  |  |  | (CO2) [Knowledge] |

1. Define an Assignment Problem (CO3) [Knowledge]

#### Part B [Thought Provoking Questions]

**Answer all the Questions. Each question carries Ten marks (4Q X 10M =40M)**

1. Solve the following LPP graphically. Max *Z* = 5*X*1 + 3*X*2

subject to 3*X*1 + 5*X*2 ≤ 15 5*X*1 + 2*X*2 ≤ 10

and *X*1, *X*2 ≥ 0

(CO1) [Comprehension]

1. A firm manufactures two products A and B on which the profits earned per unit are Rs.3 and Rs.4 respectively. Each product is processed on two machines M1 and M2. Product A requires one minute of processing time on M1 and two minutes on M2. Product B requires one minute each on M1 and M2. Machine M1 is available for not  more than 7 hours 30 minutes while M2 is available for 10 hours during any working  day. Formulate this as a LPP. (CO1) [Comprehension]
2. Determine an initial basic feasible solution to the following transportation problem by using Vogel’s approximation method.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Destination |  | | | | | |
|  |  | D1 | D2 | D3 | D4 | Supply |  |
| Origin | O1 | 6 | 4 | 1 | 5 | **14** |  |
|  | O2 | 8 | 9 | 2 | 7 | **16** |  |
|  | O3 | 4 | 3 | 6 | 2 | **5** |  |
|  | Demand | **6** | **10** | **15** | **4** | **35** |  |
|  |  |  |  |  |  |  | (CO2) [Comprehension] |

1. A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimates of the times that each man would take to perform each task is given in the matrix below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | tasks |  | | | |
|  |  | I | II | III | IV |
| Subordinates | A | 8 | 26 | 17 | 11 |
|  | B | 13 | 28 | 4 | 26 |
|  | C | 38 | 19 | 18 | 15 |
|  | D | 19 | 26 | 24 | 10 |

How should the tasks be allocated to subordinates so as to minimize the total man- hours?

(CO3) [Comprehension]

#### Part C [Problem Solving Questions]

**Answer all the Questions. Each question carries Fifteen marks (2Q X 15M =30M)**

1. Determine the optimal solution for the following transportation problem.

Destination

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | D1 | D2 | D3 | D4 | Supply |
| source | S1 | 19 | 30 | 50 | 10 | **7** |
|  | S2 | 70 | 30 | 40 | 60 | **9** |
|  | S3 | 40 | 8 | 70 | 20 | **18** |
|  | Demand | **5** | **8** | **7** | **14** | **34** |

(CO1) [Application]

1. Solve the following LPP using simplex method.

Max *Z* = 3*X*1 + 2*X*2

subject to *X*1 + *X*2 ≤ 6

2X1 + *X*2 ≤ 6

and *X*1, *X*2 ≥0 (CO2) [Application]