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| |  | | --- | |  | |  |  | Register Number:  Date: 14-12-2022 (9am)   |  | | --- | |  | |
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| **ST. JOSEPH’S COLLEGE(AUTONOMOUS), BANGALORE-27** | | | | | |
| **BCA- V SEMESTER** | | | | | |
| **SEMESTER EXAMINATION: OCTOBER 2022**  (Examination conducted in December 2022) | | | | | |
| **CA5418-OPERATION RESEARCH** | | | | | |
|  |  |  |  |
| **Time- 2 1/2 Hrs.** | |  | **Max Marks-70** | |
|  | |  |  | |

**This question paper contains four pages and three parts**

**Instructions: Students are allowed to use Graph sheets.**

**PART A**

**Answer all the following questions (10\*2=20)**

**1.** Define the term Operation Research.

**2.** Who coined the term Operation Research

**3.** What is the main goal of transportation problem?

**4.** What are Slack and Surplus variables?

**5.** Hungarian method can be applied to solve what type of problems?

**6.** What are the assumptions we consider for solving transportation problem?

**7.** What is Total float? Write the mathematical formula for it.

**8.** Define the following terms.

1. Dummy Activity
2. Dangling Event

**9.** What do you mean by latest completion time for an activity in a PERT network? Write its mathematical formula.

**10.** Explain the rule to find the saddle point.

**PART B**

**Answer any Five of the following (5\*6=30)**

**11.** A milk plant manufactures two types of products A and B and sells them at a profit of Rs. 5 on type A and Rs. 3 on type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H; type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes, while machine H is available for 8 hours 20 minutes during any working day; formulate the problem as LP problem**.**

**12.** Solve the following LPP by graphical method:

Maximize Z=12 x+16 y

subject to the constraints 10x+20y<=120

8x+8y<=80

where x, y>=0

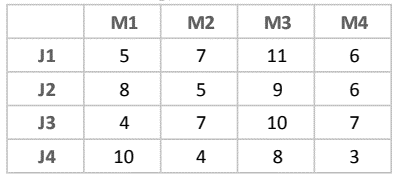
**13.** a. How do you find the optimal solution in a transportation problem? [2+4]

b. Determine the initial basic feasible solution for the following transportation problem

using Vogel’s Approximation method.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DESTINATION** | | | | | | | | |
| **SOURCE** |  | **1** | **2** | **3** | **4** | **5** | **SUPPLY** |
| **A** | 2 | 11 | 10 | 3 | 7 | **4** |
| **B** | 1 | 4 | 7 | 2 | 1 | **8** |
| **C** | 3 | 9 | 4 | 8 | 12 | **9** |
|  | **DEMAND** | **3** | **3** | **4** | **5** | **6** |  |

**14.** The owner of a small machine shop has four machines available to assign four jobs. The set-up and the take down cost are assumed to be negligible. The matrix below gives the cost in rupees for producing job i on machine j. How should the job be assigned to the various machines so the total cost is minimized.



**15.** Solve the following transportation problem using Least Cost method.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **D1** | **D2** | **D3** | **D4** | **AVAILABILITY** |
| **S1** | 10 | 2 | 20 | 11 | **15** |
| **S2** | 12 | 7 | 9 | 20 | **25** |
| **S3** | 4 | 14 | 16 | 18 | **10** |
| **REQUIREMENT** | **5** | **15** | **15** | **15** |  |

**16.** The following table represents the payoff matrix with respect to player A. Solve it optimally to find the saddle point and the value of the game.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PLAYER A** | **PLAYER B** | | | | | |
|  | **1** | **2** | **3** | **4** | **5** |
| **1** | 4 | 6 | 5 | 10 | 6 |
| **2** | 7 | 8 | 5 | 9 | 10 |
| **3** | 8 | 9 | 11 | 10 | 9 |
| **4** | 6 | 4 | 10 | 6 | 4 |

**17.** Consider a project with activities A, B, C, D, E and F. The following table shows the precedence and duration (in days) of each of the activities. Draw the project network diagram.

|  |  |  |
| --- | --- | --- |
| **ACTIVITY** | **PREDECESSORS** | **DURATION (DAYS)** |
| A | -- | 12 |
| B | A, F | 16 |
| C | E | 10 |
| D | A, B, E | 16 |
| E | A | 12 |
| F | -- | 8 |

**PART C**

**Answer any two of the following (2\*10=20)**

**18.** Consider the details of a project as shown in the table below and [5+5]

1. Construct the CPM network.
2. Determine the **critical path** and **project completion time**.

|  |  |  |
| --- | --- | --- |
| **ACTIVITY** | **IMMEDIATE PRECEDENCE** | **DURATION(Months)** |
| A | - | 2 |
| B | - | 5 |
| C | - | 4 |
| D | B | 5 |
| E | A | 7 |
| F | A | 3 |
| G | B | 3 |
| H | C, D | 6 |
| I | C, D | 2 |
| J | E | 5 |
| K | F, G, H | 4 |
| L | F, G, H | 3 |
| M | I | 12 |
| N | J, K | 8 |

**19.** a. Mention any four phases of Operation Research. [4+6]

b. Solve the following LPP using simplex method

Maximize *Z*= 2 *x*1 +3*x*2

subject to constraints *x*1 + *x*2 ≤ 30; *x*2 ≤ 12; *x*1 ≤ 20

and *x*1,*x*2≥ 0

**20.** a. Find the initial basic feasible solution of the following transportation problem by North West corner rule method

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | D1 | D2 | D3 | D4 | SUPPLY |
| S1 | 3 | 1 | 7 | 4 | 250 |
| S2 | 2 | 6 | 5 | 9 | 350 |
| S3 | 8 | 3 | 3 | 2 | 400 |
| DEMAND | 200 | 300 | 350 | 150 |  |

b. Optimize the above solution using UV method/MODI's method. [5+5]