Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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|  |  |  |  |
| **Code :** | **16MA2004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **OPERATIONS RESEARCH** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Using Graphical method solve  Max Z= 3x+2y  Subject to -2x+3y≤9 : 3x-2y ≤ -20: x,y≥ 0. | CO1 | 20 |
| **(OR)** | | | | |
| 2. |  | Using Simplex method solve  Max Z= 13x-12y  Subject to 2x+5y≤40 : 3x-y ≤30: 2x+3y ≤60 x,y≥ 0. | CO2 | 20 |
|  |  |  |  |  |
| 3. | a. | Solve the following Transportation problem.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | D1 | D2 | D3 | D4 | ai | | O1 | 6 | 3 | 1 | 5 | 15 | | O2 | 2 | 4 | 9 | 2 | 12 | | O3 | 5 | 3 | 1 | 4 | 13 | | rj | 12 | 5 | 8 | 15 |  | | CO3 | 15 |
| b. | Using North west Corner rule, Least cost method and Vogel’s approximation method find the initial basic feasible solution for the following transportation problem.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 1 | 0 | 2 | 3 | 15 | | 2 | 5 | 1 | 2 | 12 | | 0 | 2 | 6 | 4 | 13 | | 0 | 2 | 1 | 1 | 18 | | 20 | 8 | 15 | 15 |  | | CO3 | 5 |
| **(OR)** | | | | |
| 4. |  | Find the optimum Transportation using MODI method.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | M1 | M2 | M3 | M4 | ai | | J1 | 90 | 90 | 100 | 110 | 200 | | J2 | 50 | 70 | 130 | 85 | 100 | | J3 | 0 | 0 | 0 | 0 | 5 | | Rj | 75 | 100 | 100 | 30 |  | | CO3 | 20 |
|  |  |  |  |  |
| 5. |  | Solve the following maximization assignment problem.   |  | | --- | | 10 5 9 18 11  13 19 6 12 14  3 2 4 4 5  18 9 12 17 15  11 6 14 19 10 | | CO4 | 20 |
| **(OR)** | | | | |
| 6. | a. | Find the Optimum Travelling salesman distance, if the distance between city A,B,C,D and E in order is as follows.   |  | | --- | | ∞ 5 12 6 4 3  6 ∞ 10 5 4 3  8 7 ∞ 6 3 11  5 4 11 ∞ 5 8  5 2 7 8 ∞ 4  6 3 11 5 4 ∞ | | CO4 | 20 |
|  |  |  |  |  |
| 7. | a. | Solve the game whose payoff matrix is as follows (Player A Vs Player B)   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | B1 | B2 | B3 | B4 | B5 | | A1 | 7 | 5 | 2 | 3 | 9 | | A2 | 6 | 6 | 4 | 5 | 10 | | A3 | 5 | 4 | 5 | 6 | 8 | | A4 | 8 | 3 | 3 | 2 | 6 | | CO5 | 20 |
| **(OR)** | | | | |
| 8. |  | Using Graphical method solve the Game problem  Player B   |  | | --- | | 5 3  4 9  0 10 |   Player A | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | A self service store employs one cashier at its counter. 9 customers arrive on an average every 5 minutes while the cashier serves 10 customers in 5 minutes. Assume Poisson distribution of arrival and service. Calculate λ, μ , Ls, Lq,Ws ,Wq | CO6 | 10 |
| b. | A person repairing radios finds that the time spent on the radio set has been exponential with mean 20 minutes. If the radios are repaired in the order in which they come in and the arrival is approx Poisson with an average rate of 15 for 8 hours per day,  Calculate λ, μ , Ls, Lq,Ws ,Wq | CO6 | 10 |