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



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

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| **Code :** | **16MA3004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **APPLIED OPERATIONS RESEARCH** | **Max. Marks :** | **100** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Marks** |
| 1. | a. | Using Graphical method Solve  Max Z= 4x+7y  Subject to x≤40 : y ≤30: x+y ≤60 x,y≥ | 10 |
| b. | Using Graphical method Solve  Min Z= 3x+2y  Subject to -2x+3y ≥ 9 : 3x - 2y ≤ -20 x,y≥ 0. | 10 |
| **(OR)** | | | |
| 2. |  | Using Simplex method solve  Max Z= 3x+5y  Subject to x≤40 : y ≤30: x+y ≤60 x,y≥ 0. | 20 |
|  |  |  |  |
| 3. | a. | Find the optimum Transportation using MODI.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | M1 | M2 | M3 | M4 | ai | | J1 | 2 | 3 | 11 | 7 | 6 | | J2 | 1 | 0 | 5 | 1 | 1 | | J3 | 5 | 8 | 15 | 2 | 10 | | Rj | 7 | 5 | 3 | 2 |  | | 20 |
| **(OR)** | | | |
| 4. |  | Solve the following transportation problem :  Warehouses  D E F G Available  A 11 13 17 14 250  B 16 18 14 10 300  C 21 24 13 10 400  Requirement 200 225 275 250 950 | 20 |
|  |  |  |  |
| 5. |  | Solve the following maximization assignment problem.   |  | | --- | | 10 5 13 15 16  3 9 18 3 6  10 7 2 2 2  5 11 9 7 12  7 9 10 4 12 | | 20 |
| **(OR)** | | | |
| 6. | a. | Solve the following assignment problem to find the minimum cost.   |  | | --- | | 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 | | 20 |
|  |  |  |  |
| 7. | a. | A self service stroe 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 servie Calculate λ, μ , Ls, Lq,Ws ,Wq | 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 oer day. Calculate λ, μ , Ls, Lq,Ws ,Wq | 10 |
| **(OR)** | | | |
| 8. | a. | Given the following data regarding the processing times of some jobs on three machines M1, M2, M3. The order of processing is M1 – M2 – M3. Determine the sequence that minimizes the total elapsed time (T) require to complete the following jobs. Also evaluate T and the idle times of M1, M2 and M3.   |  |  |  |  | | --- | --- | --- | --- | | Jobs | Processing Time (Minutes) | | | |  | M1 | M2 | M3 | | A | 8 | 6 | 10 | | B | 5 | 2 | 13 | | C | 4 | 9 | 11 | | D | 6 | 7 | 10 | | E | 5 | 4 | 12 | | 10 |
| b. | Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following processing time in hours. Find also the total elapsed time and idle time of machines.     |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Job: | A | B | C | D | E | | Machine M1: | 8 | 5 | 4 | 6 | 5 | | Machine M2: | 6 | 2 | 9 | 7 | 4 | | Machine M3: | 10 | 13 | 11 | 10 | 12 | | 10 |
|  | | **Compulsory**: |  |
| 9. |  | Construct the network diagram and find the critical path for the data, the expected completion time of the project, variance:-   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | tasks: | 1-2 | 1-3 | 2-4 | 2-3 | 3-4 | 3-5 | 4-6 | 5-6 |  | | t0 (days) : | 2 | 4 | 2 | 2 | 0 | 3 | 6 | 1 |  | | tm (days) : | 6 | 8 | 3 | 4 | 0 | 6 | 10 | 3 |  | | tp (days) : | 10 | 12 | 4 | 6 | 0 | 9 | 14 | 5 |  | |  |  |  |  |  |  |  |  |  |  | | 20 |