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



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

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| **Code :** | | **19MA3031** | **Duration :** | | **3hrs** | |
| **Sub name:** | | **OPERATIONS RESEARCH** | **Max. Marks :** | | **100** | |
| **Q. No.** | **Sub Div.** | **Questions** | | **Course Outcome** | | **Marks** | |
| **ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)** | | | | | | | |
| 1. | a. | Using Graphical method Solve  Max Z= 4x+7y  Subject to x≤40 : y ≤30: x+y ≤60 x,y≥ | | CO1 | | 8 | |
| b. | Using Graphical method Solve  Max Z= 4x+5y  Subject to x+y ≤ 10 : 2x+5y ≥ 35 x,y≥ 0 | | CO1 | | 8 | |
|  |  |  | |  | |  | |
| 2. |  | Calculate the optimum transportation cost :  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 | | CO3 | | 16 | |
|  |  |  | |  | |  | |
| 3. | a. | Solve the game whose pay off matrix is follows (Player A Vs Player B)   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | B1 | B2 | B3 | B4 | | A1 | 7 | 5 | 2 | 3 | | A2 | 6 | 6 | 4 | 5 | | A3 | 6 | 8 | 5 | 6 | | A4 | 8 | 3 | 3 | 2 | | | CO4 | | 8 | |
|  | b. | Solve the game whose pay off matrix is as follows (Player A Vs Player B) using Graphical method   |  | | --- | | -1 2 -2  6 4 -6 | | | CO4 | | 8 | |
|  |  |  | |  | |  | |
| 4. | a. | A T.V repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is Poisson with an average rate of 10 per 8 hour day, Calculate λ, μ , Ls, Lq,Ws ,Wq | | CO5 | | 8 | |
|  | 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 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 | | CO5 | | 8 | |
|  |  |  | |  | |  | |
| 5. | a. | In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A,B. The processing timings (in hours) or the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time.  Job : 1 2 3 4 5 6  Machine A: 1 3 8 5 6 3  Machine B: 5 6 3 2 2 10 | | CO5 | | 8 | |
| b. | Use the graphical method to minimize the time needed to process the following jobs on the machine shown, i.e. for each machine find the job that should be done first. Also, calculate the total elapsed time to complete both jobs.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Machine | | | | | | | Job 1 sequence | A | B | C | D | E | | Time(Hrs) | 3 | 4 | 2 | 6 | 2 | | Job 2 sequence | B | C | A | D | E | | Time(Hrs) | 5 | 4 | 3 | 2 | 6 | | | CO5 | | 8 | |
|  |  |  | |  | |  | |
| 6. |  | Using Simplex method Solve  Max Z= 2x-3y+z  Subject to x+y+z≤10 :4x-3y+z ≤3: 2x+y-z ≤10 x,y,z ≥ 0 | | CO1 | | 16 | |
|  |  |  | |  | |  | |
| 7. | a. | A departmental head has four subordinates and our tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate , of the time each man would take to perform each task , is given in the matrix given below:  Men  Tasks E F G H  A 18 26 17 11  B 13 28 14 26  C 38 19 18 15  D 19 26 24 10  How should the tasks be assigned, one to a man, so as to minimize the total man-hours using assignment? | | CO3 | | 8 | |
| b | A company manufacturing scooters produces about 100 scooters a day. The probability distribution of production is given below:-   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Production per day: | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | | Probability: | 0.06 | 0.08 | 0.11 | 0.15 | 0.20 | 0.15 | 0.11 | 0.08 | 0.06 |   The finished scooters are transported in a boat having space for 100 scooters only. Using the random numbers 30, 96, 53, 52, 80, 95, 78, 30, 64, 71, 68, 50, 74, 02 and 83, find the average number of scooters waiting in the factory and also the average number of empty spaces in the boat in 15 trials | | CO6 | | 8 | |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | | | | |
| 8. |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | task | 1-2 | 1-3 | 2-5 | 3-4 | 4-5 | 5-8 | 4-6 | 4-7 | 6-9 | 8-9 | 7-10 | 9-10 | | t0 | 3 | 1 | 6 | 8 | 0 | 5 | 6 | 3 | 1 | 3 | 8 | 2 | | tm | 5 | 2 | 8 | 12 | 0 | 7 | 9 | 6 | 2 | 6 | 15 | 4 | | tp | 7 | 3 | 12 | 17 | 0 | 9 | 12 | 8 | 3 | 8 | 20 | 6 |   A project is represented by the networks and has the following data. Calculate Critical path , Te, te, Vt, St, ES,EF,LS, LF, TF, FF. | | CO6 | | 20 | |