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



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

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| **Code :** | **18MA3004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **OPERATIONS RESEARCH TECHNIQUES** | **Max. Marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Solve the LPP by Simplex method  Max Z = 3x1 + 2x2 + 5x3  Subject to  x1 + x2 + x3 ≤ 9  2x1 + 3x2 + 5x3 ≤ 30  2x1 – x2 – x3 ≤ 8  where x1, x2 & x3 ≥ 0 | CO2 | 20 |
| **(OR)** | | | | |
| 2. |  | An Iron factory manager is considering the best way to transport iron from his three manufacturing centers X, Y and Z to depots P, Q, R, S and T. The weekly production and demands along with transportation cost per ton are given below:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | | Depot | | | | |  | | Manufacturing Centers |  | **P** | **Q** | **R** | **S** | **T** | Supply (tons) | | **X** | 4 | 1 | 3 | 4 | 4 | 60 | | **Y** | 2 | 3 | 2 | 2 | 3 | 35 | | **Z** | 3 | 5 | 2 | 4 | 4 | 40 | | Demand (tons) | | 22 | 45 | 20 | 18 | 30 |  |   Find out the optimum transportation cost. | CO3 | 20 |
|  |  |  |  |  |
| 3. |  | Consider the problem of assigning to solve such that processing time is minimized. The matrix entries represent processing times of job in hours.  Operators  1 2 3 4 5   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Job 1 | 10 | 12 | 15 | 12 | 8 | | 2 | 7 | 16 | 14 | 14 | 11 | | 3 | 13 | 14 | 7 | 9 | 9 | | 4 | 12 | 10 | 11 | 13 | 10 | | 5 | 8 | 13 | 15 | 11 | 15 | | CO3 | 20 |
| **(OR)** | | | | |
| 4. |  | Five jobs and each of which has to go through the machines A, B and C in the order A, B, and C. Processing time in minutes are given below:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Jobs | 1 | 2 | 3 | 4 | 5 | | Machine A | 40 | 90 | 80 | 60 | 50 | | Machine B | 50 | 60 | 20 | 30 | 40 | | Machine C | 80 | 100 | 60 | 70 | 110 |   Determine a sequence for the five jobs that will minimize the elapsed time T. Also calculate the idle time of Machine A, B and C. | CO5 | 20 |
|  |  |  |  |  |
| 5. |  | A repair shop attended by a single mechanic has an average of four customers an hour who bring small appliances for repair. The mechanic inspects them for defects and can quite often fix them right away or otherwise render a diagnosis. This takes him six minutes on an average. Arrivals are Poisson and service time has exponential distribution. You are required to   1. Find the proportion of time during which the shop is empty. 2. Find the probability of having at least one customer in the shop. 3. What is the average number of customers in the system? 4. Find the average time spent, including service. | CO4 | 20 |
| **(OR)** | | | | |
| 6. |  | Construct the network for the project whose activities are given below and compute the total float of each activity, determine the critical path and the project duration.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | 1-2 | 1-3 | 1-5 | 2-3 | 2-4 | 3-4 | 3-5 | 3-6 | 4-6 | 5-6 | | Duration in weeks | 8 | 7 | 12 | 4 | 10 | 3 | 5 | 10 | 7 | 4 | | CO6 | 20 |
|  |  |  |  |  |
| 7. |  | The following table indicates the details of a project. The duration is in days. ‘a’ refers to optimistic time, ‘m’ refers to most likely time and ‘b’ refers to pessimistic time duration.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | 1-2 | 1-3 | 1-4 | 2-4 | 2-5 | 3-5 | 4-5 | | A | 2 | 3 | 4 | 8 | 6 | 2 | 2 | | M | 4 | 4 | 5 | 9 | 8 | 3 | 5 | | b | 5 | 6 | 6 | 11 | 12 | 4 | 7 |  1. Draw the network. 2. Find the critical path. 3. Determine the expected standard deviation of the completion time.   d. What is the probability that the project is completed in 27 days? | CO6 | 20 |
| **(OR)** | | | | |
| 8. | a. | Define simulation. How a simulation is applied in managerial decision making? | CO3 | 10 |
| b. | Write a short note on: (i) Floats and its types, (ii) Dummy activity and (iii) Critical Path, in networks. | CO4 | 10 |
| **Compulsory:** | | | | |
| 9. |  | Solve the LPP by graphical method  Maximize Z = 10x1 + 15x2 + 20 x3  Subject to,  2x1 + 4x2 + 6x3 ≤ 24  3x1 + 9x2 + 6x3 ≤ 30  where x1, x2 & x3 ≥ 0 | CO2 | 20 |