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| **QUESTIONBANK(DESCRIPTIVE)**  **Subject Name with Code: OPTIMIZATION TECHNIQUES (23A0020T)**  **Course & Branch: B.TECH CSE(DS) Year& Semester: II-II**  **Regulation: RG23** | |

**UNIT - I**

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| **S.No.** | **Question** | | **[BT Level] [CO][ Marks]** | | |
| **2 Marks Questions (Short)** | | | | | |
|  | | What are limitations of LPP | | [L1][CO1][2M] |
|  | | What is an artificial variable. | | [L1][CO1][2M] |
|  | | What are the signifince of optimization. | | [L1][CO1][2M] |
|  | | What is the purpose of mathematical model. | | [L1][CO1][2M] |
|  | | List the applications of optimization problem | | [L1][CO1][2M] |
|  | | Write the classification of optimization problem | | [L1][CO1][2M] |
|  | | Define objective function and optimum solution with reference to linear programming. | | [L1][CO1][2M] |
|  | | Define slack and surplus variables | | [L1][CO1][2M] |
|  | | What is unbounded solution with respect to Lpp | | [L1][CO1][2M] |
|  | | Define optimization techniques. | | [L1][CO1][2M] |
| **Descriptive Questions (Long)** | | | | | |
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|  | Solve the following LPP by using graphical method.  Max z = 5x1+3x2  Subject to the constraints,  3x1+5x2  ≤ 15  5x1+2x2  ≤ 10  X1≥0, x2≥0 | | [L3][CO1][10M] | | |
|  | Solve the following LPP by using graphical method.  Min z = 4x1+2x2  Subject to the constraints,  x1+2x2 ≥ 2  3x1+x2  ≥ 3  4x1+3x2  ≥ 6  x1, x2≥0 | | [L3][CO1][10M] | | |
|  | Solve the following LPP by using simplex method.  Max z = x1+x2+3x3  Subject to the constraints,  3x1+2x2+x3  ≤ 3  2x1+x2+2x3  ≤ 10  x1, x2,x3≥0 | | [L3][CO1][10M] | | |
|  | Solve the following LPP by using simplex method.  Min z = -2x1- 3x2  Subject to the constraints,  x1+x2  ≤ 2  x1+x2  ≤ 4  x1,x2 ≥ 0 | | [L3][CO1][10M] | | |
| **5.** | Use Big-m method and solve the following lpp  Maxz = 6x1+ 4x2  Subject to the constraints,  2x1+3x2  ≤ 30  3x1+4x2  ≤ 24  x1+x2  ≥ 3  x1,x2 ≥ 0 | | [L3][CO1][10M] | | |
| **6.** | Use Big-m method and solve the following lpp  Minz = 4x1+ 3x2  Subject to the constraints,  2x1+x2  ≥ 10  -3x1+2x2  ≤6  x1+x2  ≥ 6  x1,x2 ≥ 0 | | [L3][CO1][10M] | | |
| **7.** | Solve the following LPP by using Two Phases simplex method.  Max z = -4x1-3 x2-9x3  Subject to the constraints,  2x1+4x2+6x3  ≥ 15  6x1+x2+x3  ≥ 12  x2 ≤ 4  x1,x2,x3 ≥ 0 | | [L3][CO1][10M] | | |
| **8.** | Solve the following LPP by using Two Phases simplex method.  Min z = 3x1- x2  Subject to the constraints,  x1+x2  ≤ 50  x1 ≥ 20  x2 ≤ 40  X1,x2 ≥ 0 | | [L3][CO1][10M] | | |
| **9.** | Discuss the nature and scope of quantitative analysis. | | [L2][CO1][10M] | | |
| **10.** | Define optimization techniques. What is the importance of optimization techniques in decision making. | | [L1][CO1][10M] | | |

**UNIT - II**

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| **S.No.** | **Question** | **[BT Level] [CO][ Marks]** |
| **2 Marks Questions (Short)** | | |
|  | 1. Define Assignment Problem. | [L1][CO2][2M] |
|  | 1. How to detect degeneracy in transportation problem. | [L1][CO2][2M] |
|  | 1. Distinguish between transportation problem and assignment problem. | [L4][CO2][2M] |
| **4.** | 1. What is the use of vogel’s approximation method | [L1][CO3][2M] |
| **5.** | 1. Given the mathematical formulation of assignment problem. | [L3][CO2][2M] |
| **6.** | 1. What is the principle of optimality. | [L1][CO2][2M] |
| **7.** | 1. What is the advantages and disadvantages of NWC. | [L1][CO2][2M] |
| **8.** | 1. Explain assumptions of transportation problem. | [L2][CO2][2M] |
| **9.** | 1. Define feasible solution and optimal solution. | [L1][CO2][2M] |
| **10.** | 1. Difference between balanced and unbalanced transportation problem. | [L4][CO2][2M] |
| **Descriptive Questions (Long)** | | |
|  | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | W1 | W2 | W3 | W4 | SUPPLY | | P1 | 21 | 40 | 30 | 15 | 10 | | P2 | 60 | 25 | 50 | 55 | 8 | | P3 | 45 | 10 | 60 | 10 | 17 | | DEMAND | 6 | 7 | 8 | 14 |  |   With the help of North-West corner method, solve the following transportation problem. | [L3][CO2][10M] |
|  | Using matrix minimum method. find out the initial basic feasible solution of the following transportation problem. also calculate the total transportation cost.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | A | B | C | D | SUPPLY | | X | 21 | 16 | 25 | 13 | 21 | | Y | 17 | 18 | 14 | 22 | 27 | | Z | 32 | 27 | 12 | 41 | 19 | | DEMAND | 14 | 15 | 18 | 20 |  | | [L3][CO2][10M] |
|  | Determine the intial basic feasible solution of following transportion problem so as the products are transported at a lowest cost by using VAM.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | TO | A1 | A2 | A3 | A4 | SUPPLY | | X1 | 8 | 12 | 8 | 6 | 4500 | | X2 | 7 | 15 | 7 | 13 | 6000 | | X3 | 5 | 9 | 10 | 11 | 7000 | | DEMAND | 6000 | 4500 | 3000 | 4000 |  | | [L3][CO2][10M] |
|  | Find the optimum solution of the following transportation problem using VAM and MODI method, where cells shows the transportation costs in rupes.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | TO | W1 | W2 | W3 | W4 | SUPPLY | | O1 | 6 | 4 | 1 | 5 | 14 | | O2 | 8 | 9 | 2 | 7 | 16 | | O3 | 2 | 6 | 3 | 4 | 15 | | DEMAND | 10 | 12 | 15 | 8 |  | | [L3][CO2][10M] |
|  | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | TO | A | B | C | D | SUPPLY | | O1 | 6 | 8 | 7 | 12 | 500 | | O2 | 10 | 13 | 9 | 11 | 400 | | O3 | 8 | 10 | 12 | 14 | 900 | | DEMAND | 700 | 500 | 400 | 300 |  |   Applying North West Corner method, solve the following transportation problem. | [L3][CO2][10M] |
| **6.** | Solve the following assignment problem using Hungarian method   |  |  |  |  | | --- | --- | --- | --- | | TASKS | | | | | Men | A | B | C | D | | 1 | 45 | 40 | 50 | 67 | | 2 | 57 | 42 | 63 | 55 | | 3 | 49 | 51 | 48 | 64 | | 4 | 41 | 45 | 60 | 55 | | [L3][CO2][10M] |
| **7.** | A sales manger has to assign salesman to four territories. He has four candidates of varying experience and capacities. You are required to find the assigning task to each salesman using assignment model.     |  |  |  |  |  | | --- | --- | --- | --- | --- | | territories | | | | | | Salesman | A | B | C | D | E | | 1 | 70 | 54 | 56 | 74 | 58 | | 2 | 56 | 68 | 58 | 80 | 61 | | 3 | 70 | 48 | 64 | 60 | 72 | | 4 | 48 | 64 | 50 | 64 | 63 | | [L3][CO2][10M] |
| **8.** | Consider the following matrix that shows the four jobs done by four machines. using Hungarian method. Assign the jobs in such a manner that maximizes the total profit.   |  |  |  |  | | --- | --- | --- | --- | | MACHINES | | | | | JOBS | M1 | M2 | M3 | M4 | | J1 | 15 | 11 | 13 | 15 | | J2 | 13 | 12 | 12 | 13 | | J3 | 14 | 15 | 16 | 14 | | J4 | 16 | 13 | 11 | 17 | | [L3][CO2][10M] |
| **9.** | Explain procedure or of Hungarian method to solve the assignment problem | [L2][CO2][10M] |
| **10.** | Explain procedure or of NWC and LCM to solve the transportation problem | [L2][CO2][10M] |

**UNIT - III**

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| **S.No.** | **Question** | **[BT Level] [CO][ Marks]** |
| **2 Marks Questions (Short)** | | |
|  | Discuss basic terms used in sequencing problem. | [L2][C03][2M] |
|  | Given any example of sequencing problem from your daily life. | [L3][C03][2M] |
| **3.** | What is sequencing problem. | [L1][C03][2M] |
| **4.** | Explain principle assumptions of sequencing problem. | [L2][C03][2M] |
| **5.** | What are the benefits of sequencing problem | [L1][C03][2M] |
| **6.** | Define total elapsed time. | [L1][C03][2M] |
| **Descriptive Questions (Long)** | | |

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| **Q.No.** |  |  |
| 1. | Six jobs go first over machine-I and then over machine-II. The orders of completion of jobs have no significance. The following gives the machine times in hours for six jobs and two machines.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | JOB | 1 | 2 | 3 | 4 | 5 | 6 | | MACHINE-I | 5 | 9 | 4 | 7 | 8 | 6 | | MACHINE-II | 7 | 4 | 8 | 3 | 9 | 5 |   Find the optimal total time and the idle times of machines | [L3][C03][10M] |
| 2. | There are 5 jobs each of which must go through 2 machines A and B in the order AB. Processing time are given below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | JOB | 1 | 2 | 3 | 4 | 5 | | MACHINE-A | 5 | 1 | 9 | 3 | 10 | | MACHINE-B | 2 | 6 | 7 | 8 | 4 |   Determine a sequence for the 5 jobs that will minimize the total elapsed time. | [L3][C03][10M] |
| 3. | we have 6 jobs each of which must go through the machines A,B and in the orderd ABC determine the sequence that will minimize the total elapsed time.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | JOB | 1 | 2 | 3 | 4 | 5 | 6 | | MACHINE-A | 3 | 12 | 5 | 2 | 9 | 11 | | MACHINE-B | 8 | 6 | 4 | 6 | 3 | 1 | | MACHINE-C | 13 | 14 | 9 | 12 | 8 | 13 | | [L3][C03][10M] |
| 4. | we have 5 jobs each of which must go through the machines A,B and in the orderd ABC determine the sequence that will minimize the total elapsed time.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | JOB | 1 | 2 | 3 | 4 | 5 | | MACHINE-A | 5 | 7 | 6 | 9 | 5 | | MACHINE-B | 2 | 1 | 4 | 5 | 3 | | MACHINE-C | 3 | 7 | 5 | 6 | 7 |   Find the optimal total time and the idle times of machines. | [L3][C03][10M] |
| 5. | a batch of 4 jobs can be assigned to 5 different machines. The setup time (in hours) for each job on various machines is given below. find the optimal assignment of jobs to machines which will minimize the total setup time.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | JOB /MACHINES | A | B | C | D | | 1 | 8 | 3 | 4 | 7 | | 2 | 9 | 2 | 5 | 5 | | 3 | 6 | 4 | 5 | 8 | | 4 | 12 | 5 | 1 | 9 | | 5 | 7 | 1 | 2 | 3 | | [L3][C03][10M] |
| 6. | A) Describe n Jobs Through 3 Machines Procedure  B) Describe n Jobs Through k Machines Procedure | [L2][C03][5M]  [L2][C03][5M] |
| 7. | Determine the minimum time required to process job 1 and jobs 2 on different machines with the help of graphical method as the processing time is shown in table below.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | JOB-1 | Sequence | A | B | C | D | E | | TIME(HRS) | 2 | 3 | 4 | 6 | 2 | | JOB-2 | Sequence | C | A | D | E | B | | TIME(HRS) | 4 | 5 | 3 | 2 | 6 | | [L3][C03][10M] |
| 8. | Determine the minimum time required to process job 1 and jobs 2 on different machines with the help of graphical method as the processing time is shown in table below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | JOB-1 | Sequence A | B | C | D | E | | TIME(HRS) | 4 | 6 | 8 | 12 | | JOB-2 | Sequence C | A | D | E | B | | TIME(HRS) | 8 | 10 | 6 | 4 | | [L3][C03][10M] |
| 9. | In There are 4 jobs, each of which has to go through the machines Mij = 1,2,… 6 in the order M1,M2,…..M6. Processing time (in hours) for each machine is given bellow.  Determine the sequence of the four jobs that minimize the total elapsed time.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | Machines | | | | | | | JOB | M1 | M2 | M3 | M4 | M5 | M6 | | Job A | 20 | 10 | 9 | 4 | 12 | 27 | | Job B | 19 | 8 | 11 | 8 | 10 | 21 | | Job C | 13 | 7 | 10 | 7 | 9 | 17 | | Job D | 22 | 6 | 5 | 6 | 10 | 14 | | [L3][C03][10M] |
| 10 | Describe n Jobs Through 2 Machines Procedure | [L2][C03][10M] |

**UNIT – IV**

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| **S.No.** | **Question** | **[BT Level] [CO][ Marks]** |
| **2 Marks Questions (Short)** | | |
| **1.** | What are the two person zero sum game. | [L1][CO4][2M] |
| **2.** | Define pure and mixed strategies. | [L1][ CO4][2M] |
| **3.** | State the rules of dominance in game theory. | [L1][ CO4][2M] |
| **4.** | Discuss the game theory with examples. | [L2][ CO4][2M] |
| **5.** | Define payoff matrix. | [L1][ CO4][2M] |
| **6.** | Describe the Maximin – Minimax Principle of Game Theory. | [L2][ CO4][2M] |
| **7.** | Define Saddle Point and the Value of Game. | [L1][ CO4][2M] |
| **8.** | Solve the game whose pay-off matrix is given by   |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | 20 | 15 | 22 | | A2 | 35 | 45 | 40 | | A3 | 18 | 20 | 25 | | [L3][ CO4][2M] |
| **9** | Solve the game whose Pay-off matrix is given by and find Value of the Game     |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | 1 | 3 | 1 | | A2 | 0 | -4 | -3 | | A3 | 1 | 5 | -1 | | [L3][ CO4][2M] |
| **10.** | Discuss limitations of game theory. | [L2][ CO4][2M] |
| **Descriptive Questions (Long)** | | |

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| **So.No.** |  | **[BT Level] [CO][ Marks]** |
| 1. | Solve the following pay-off matrix. Also Determine the optimal strategies and value of the game   |  |  |  | | --- | --- | --- | |  | B1 | B2 | | A1 | 5 | 1 | | A2 | 3 | 4 | | [L3][ CO4][10M] |
| 2. | Solve the following pay-off matrix. Also Determine the optimal strategies and value of the game   |  |  |  | | --- | --- | --- | |  | B1 | B2 | | A1 | 6 | 9 | | A2 | 8 | 4 | | [L3][ CO4][10M] |
| 3. | Solve the following game using graphical Method.     |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | B1 | B2 | B3 | B4 | | A1 | 2 | 1 | 0 | -2 | | A2 | 1 | 0 | 3 | 2 | | [L3][ CO4][10M] |
| 4. | Solve the following game using graphical Method.     |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | B1 | B2 | B3 | B4 | B5 | | A1 | -4 | 2 | 5 | -6 | 6 | | A2 | 3 | -9 | 7 | 4 | 8 | | [L3][ CO4][10M] |
| 5. | Solve the following game using graphical Method.  Player B     |  |  |  | | --- | --- | --- | |  | B1 | B2 | | A1 | 1 | 2 | | A2 | 5 | 4 | | A3 | -7 | 9 | | A4 | -4 | -3 | | A5 | 2 | 1 | | [L3][ CO4][10M] |
| 6. | Solve the following game using graphical Method  Player B     |  |  |  | | --- | --- | --- | |  | B1 | B2 | | A1 | -3 | 1 | | A2 | 5 | 3 | | A3 | 6 | -1 | | A4 | 1 | 4 | | A5 | 2 | 2 | | A6 | 0 | -5 |   Player A | [L3][ CO4][10M] |
|  |  |
| 7. | Solve the following game by using dominance property     |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | 1 | 7 | 2 | | A2 | 6 | 2 | 7 | | A3 | 5 | 1 | 6 | | [L3][ CO4][10M] |
| 8. | Solve the following game by using dominance property     |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | 3 | -2 | 4 | | A2 | -1 | 4 | 2 | | A3 | 2 | 2 | 6 | | [L3][ CO4][10M] |
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| 9. | Describe Graphical method 2 X n Game Procedure d | [L2][ CO4][10M] |
|  |  |
| 10. | Describe Graphical method m X 2 Game Procedure | [L2][ CO4][10M] |

**UNIT - V**

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| **S.No.** | **Question** | **[BT Level] [CO]**  **[ Marks]** |
| 1. **Marks Questions (Short)** | | |
|  | Mention the tools and techniques used in scheduling. | [L1][CO5][2M] |
|  | Mention the applications of PERT. | [L1][CO5][2M] |
| **3.** | List the merits of CPM. | [L1][CO5][2M] |
| **4.** | List the Merits of Network Analysis. | [L1][CO5][2M] |
| **5.** | Explain principles of CPM. | [L2][CO5][2M] |
| **6.** | Mention features of PERT. | [L1][CO5][2M] |
| **7.** | List advantages and disadvantages of PERT. | [L1][CO5][2M] |
| **8.** | Explain application of CPM and PERT. | [L2][CO5][2M] |
| **9.** | Difference between CPM and PERT | [L4][CO5][2M] |
| **10.** | What is the probability of project completion. | [L1][CO5][2M] |
| **Descriptive Questions (Long)** | | |
| 1. | Describe Critical Path Method Procedure | [L2][CO5][10M] |
| 2. | A small maintenance project consists of the following jobs, whose precedence relationships are given below.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Job | 1-2 | 1-3 | 2-3 | 2-5 | 3-4 | 3-6 | 4-5 | 4-6 | 5-6 | 6-7 | | Time | 15 | 15 | 3 | 5 | 8 | 12 | 1 | 14 | 3 | 14 |  * + - 1. Draw an arrow diagram representing the project.       2. Find the total for each activity.       3. Find the critical path and the total project duration | [L3][CO5][10M] |
| 3. | Given the following information.   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | 1-2 | 1-3 | 1-4 | 2-5 | 3-6 | 3-7 | 4-6 | 5-8 | 6-9 | 7-8 | 8-9 | | Duration | 2 | 2 | 1 | 4 | 8 | 5 | 3 | 1 | 5 | 4 | 3 |  1. Draw the network diagram 2. Compute critical path and total project duration.   B. Compute total and free float for each activity. | [L3][CO5][10M] |
| 4. | Given the following information.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Activity | 0-1 | 1-2 | 1-3 | 2-4 | 2-5 | 3-4 | 3-6 | 4-7 | 5-7 | 6-7 | | Duration | 2 | 8 | 10 | 6 | 3 | 3 | 7 | 5 | 2 | 8 |  1. Draw the network diagram 2. Identify critical path and find total project duration. 3. Compute total and free float for each activity. | [L3][CO5][10M] |
| 5. | A project consists of a series of tasks labeled A,B ….H, I with the following constraints, A < D,E ; B,D < F ; C < G ; B < H ; F,G < I ; W < X,Y means X and Y cannot start until W is completed. You are required to construct a network using this notation. also find the minimum time of completion of the project when the time of completion of each task is given as follows:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Task | A | B | C | D | E | F | G | H | I | | Time (days) | 23 | 8 | 20 | 16 | 24 | 18 | 19 | 4 | 10 | | [L3][CO5][10M] |
| 6. | The following table shows the jobs of a network along with their time estimates.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Job | 1-2 | 1-6 | 2-3 | 2-4 | 3-5 | 4-5 | 6-7 | 5-8 | 7-8 | | a (days)  m (days)  b (dayss) | 1  7  13 | 2  5  14 | 2  14  26 | 2  5  8 | 7  10  19 | 5  5  17 | 5  8  29 | 3  3  9 | 8  17  32 |   Draw the project network and find the probability of the project completing in 40days. | [L3][CO5][10M] |
| 7. | A small project is composed of seven activities, whose time estimates are listed in the table as follows:   |  |  |  |  | | --- | --- | --- | --- | | Activity |  | Estimated duration (weeks) |  | |  | Optimistic (a) | Most like (m) | Pessimistic (b) | | 1-2  1-3  2-4  2-5  3-5  4-6  5-6 | 1  1  2  1  2  2  3 | 1  4  2  1  5  5  6 | 7  7  8  1  14  8  15 |   1. Draw the project network.  2. Find the expected duration and variance of each activity .  3. Calculate the earliest and latest occurrence for each event and the expected project length.  4. Calculate the variance and standard deviation of project length. | [L3][CO5][10M] |
| 8. | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Assuming that the expected times are normally distributed, find the probability of meeting  The scheduled times as given for the network.   |  |  |  |  | | --- | --- | --- | --- | | Activity |  | Days |  | |  | Optimistic (a) | Most like (m) | Pessimistic (b) | | 1-2  1-3  2-4  3-4  4-5  3-5 | 2  9  5  2  6  8 | 5  12  14  5  6  17 | 14  15  17  12  12  20 |   scheduled project completion time is 30 days. | | [L3][CO5][10M] |
| 9. | The following table shows the jobs of a network along with their time estimates. The time estimates are in days.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Job | 1-2 | 1-6 | 2-3 | 2-4 | 3-5 | 4-5 | 5-8 | 6-7 | 7-8 | | a | 3 | 2 | 6 | 2 | 5 | 3 | 1 | 3 | 4 | | m | 6 | 5 | 12 | 5 | 11 | 6 | 4 | 9 | 19 | | b | 15 | 14 | 30 | 8 | 17 | 15 | 7 | 27 | 28 |   Draw the project network.  Find the critical path.  Find the probability of the project being completed in 31 days. | [L3][CO5][10M] |
| 10. | Describe Programme Evaluation And Review Technique Procedure. | [L2][CO5][10M] |