**20EE605/JO63**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **July/August,2023** | **Electrical & Electronics Engineering** | | |
| **Sixth Semester** | **Operations Research** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |

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|  |  |  | CO | BL | M |
| 1 | a) | Define Slack variable. | CO1 | L1 | 1M |
|  | b) | Define Artificial variable. | CO1 | L1 | 1M |
|  | c) | What is Pivot element in simplex method. | CO1 | L2 | 1M |
|  | d) | What is Degeneracy in transportation problem. | CO2 | L2 | 1M |
|  | e) | Write a mathematical formulation for the transportation problem. | CO2 | L1 | 1M |
|  | f) | What is assignment problem? Give any two areas of its applications. | CO2 | L2 | 1M |
|  | g) | Write the classifications in Queuing models. | CO3 | L1 | 1M |
|  | h) | Define Ordering cost. | CO3 | L1 | 1M |
|  | i) | Define pure and mixed strategy in a game. | CO4 | L1 | 1M |
|  | j) | What is the difference between PERT and CPM. | CO4 | L2 | 1M |
|  | k) | Write the duality for following LPP  Min Zx = 2x2 + 5x3 Subject to x1+x2 ≥ 2; 2x1+x2+6x3 ≤ 6; x1 - x2 +3x3 = 4; andx1, x2 , x3 ≥ 0. | CO1 | L3 | 1M |
|  | l) | Define Unbounded solution. | CO1 | L1 | 1M |
|  | m) | List the advantages and applications of duality. | CO1 | L2 | 1M |
|  | n) | Define Unbalanced Assignment problem. | CO2 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | A factory manufactures two types of products S and T and sells them at a profit of Rs.2 and type S and Rs.3 on type T. Each product is processed on two machines M1 and M2. Type S requires 1 minute of processing time on M1 and 2 minutes on M2. Type T requires 1 minute on M1 and 1 minute on M2. Machine M1 is available not more than 6 hours 40 minutes while machine M2 is available for 10 hours during any working day. Formulate and solve the problem as an LPP so as to maximize the profit. | CO1 | L2 | 7M |
|  | b) | In the course of simplex table calculations, describe how u will detect a  a) Degenerate b) An unbounded c) non-existing feasible solution. | CO1 | L4 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Solve the following LPP  Max Z = -2x1 - x2 , Subject to 3x1 + x2 = 3; 4x1 + 3x2 ≥ 6; x1 + 2x2 ≤ 4 and x1 ≥ 0,  x2 ≥ 0. | CO1 | L3 | 7M |
|  | b) | Explain the concept of duality in LPP also write the steps for converting LPP into its dual. | CO1 | L2 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Find an optimal solution to the following transportation problem.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | W1 | W2 | W3 | W4 | Availability | | F1 | 19 | 30 | 50 | 10 | 7 | | F2 | 70 | 30 | 40 | 60 | 9 | | F3 | 40 | 8 | 70 | 20 | 18 | | Requirement | 5 | 8 | 7 | 14 |  | | CO2 | L3 | 7M |
|  | b) | Explain the step-by-step procedure to solve Assignment problem using Hungarian Method. | CO2 | L2 | 7M |
| **P.T.O**  **20EE605/JO63**  **(OR)** | | | | | |
| 5 | a) | Explain the step-by-step procedure to find initial basic feasible solution using North-West corner rule method. | CO2 | L2 | 7M |
|  | b) | Certain equipment needs 5 repair jobs which have to be assigned to 5 machines. The estimated time (in hours) that a mechanic requires to complete the repair job is given in the table. Assuming that each mechanic can be assigned only one job, determine the minimum time assignment.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | J1 | J2 | J3 | J4 | J5 | | M1 | 7 | 5 | 9 | 8 | 11 | | M2 | 9 | 12 | 7 | 11 | 10 | | M3 | 8 | 5 | 4 | 6 | 9 | | M4 | 7 | 3 | 6 | 9 | 5 | | M5 | 4 | 6 | 7 | 5 | 11 | | CO2 | L4 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Derive EOQ model for an inventory problem when shortages are allowed. | CO3 | L4 | 7M |
|  | b) | A TV 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 these come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is the repairman’s expected idle time each day? How many jobs are ahead of the average set just brought in? | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | The XYZ manufacturing company has determined from an analysis of its accounting and production data for ‘part number alpha’, that its cost to purchase is Rs. 36 per order and Rs. 2 per part. Its inventory carrying charge is 9 per cent of the average inventory. The demand of this part is 10,000 units per annum. Determine  (i) What should be the economic order quantity?  (ii) What is the optimum number of orders?  (iii) What is the optimum number of days’ supply per optimum order? | CO3 | L3 | 7M |
|  | b) | Explain briefly fundamental structure of Queueing System. | CO3 | L2 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Determine the early start and late start in respect of all node points and identify critical path for the following network. | CO4 | L4 | 7M |
|  | b) | Explain two-person zero-sum game giving suitable examples. | CO4 | L2 | 7M |
| **(OR)** | | | | | |
| 9 | a) | What are the rules for drawing network diagram? Also mention the common errors that occur in drawing networks. | CO4 | L2 | 7M |
|  | b) | Reduce the following game to 2 × 2 game using principle of dominance.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Player A | | | | Player B | | | |  | I | II III | | IV | V | VI | | I | 4 | 2 | 0 | 2 | 1 | 1 | | II | 4 | 3 | 1 | 3 | 2 | 2 | | III | 4 | 3 | 7 | –5 | 1 | 2 | | IV | 4 | 3 | 4 | –1 | 2 | 2 | | V | 4 | 3 | 3 | –2 | 2 | 2 | | CO4 | L4 | 7M |

