PAPER ID-310432

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VII) THEORY EXAMINATION 2024-25
OPERATIONS RESEARCH

TIME: 3 HRS **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

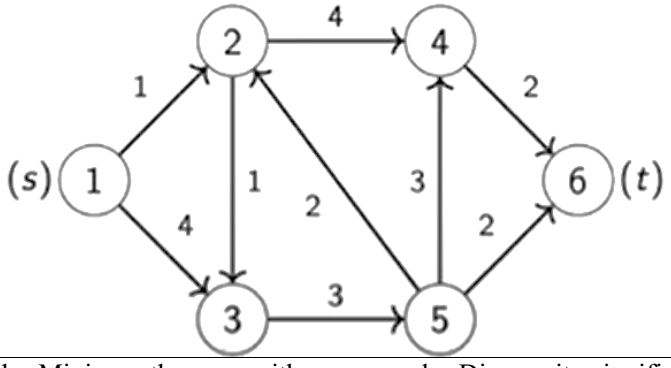
Q no.	Question	CO	Level
a.	State the principle of the Simplex method.	1	K1
b.	What is duality in Linear Programming?	1	K1
c.	Discuss the objective of transportation problems.	2	K2
d.	State the applications of job sequencing in machines.	2	K1
e.	Differentiate between CPM and PERT.	3	K2
f.	Define Critical Path in CPM.	3	K2
g.	Explain mixed strategy in game theory.	4	K2
h.	Differentiate between single-server and multi-server queuing model.	4	K2
i.	Explain EOQ in inventory control.	5	K2
j.	Differentiate between individual and group replacement policy.	5	K2

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 20**

a.	Explain the phases of Operations Research (OR) with a suitable example.	1	K2
b.	Solve the following transportation problem using the North-West Corner method to find initial solution and the MODI method to find the optimal solution.	2	K5
c.	Explain the Max-Flow problem and solve the following network flow graph to find the maximum flow between the source (s) and sink (t).	3	K5
d.	Explain the Minimax theorem with an example. Discuss its significance in game theory.	4	K2
e.	Derive the formula for Economic Order Quantity (EOQ) and explain its assumptions. Find the EOQ for the following problem:	5	K4

Source/Destination	D1	D2	D3	Supply
S1	2	3	1	10
S2	5	4	8	20
S3	5	6	8	10
Demand	15	15	10	



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	Demand = 5000 units/year, Ordering cost = ₹200/order, Holding cost = ₹5/unit/year.		

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Solve the following Linear Programming problem using the graphical method: Maximize $Z = 4x_1 + 3x_2$ Subject to: $x_1 + 2x_2 \leq 8, x_1 + x_2 \leq 6, x_1, x_2 \geq 0.$	1	K4
b.	Discuss the steps involved in solving a Linear Programming problem using the Simplex method. Illustrate with a flowchart.	1	K2

4. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Solve the assignment problem using Hungarian Method. $\begin{bmatrix} M/J & A & B & C & D \\ 1 & 7 & 5 & 8 & 4 \\ 2 & 5 & 6 & 7 & 4 \\ 3 & 8 & 7 & 9 & 8 \end{bmatrix}$	2	K4
b.	Explain the importance of job sequencing. Discuss the methods used for solving sequencing problems.	2	K2

5. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Illustrate a minimum spanning tree problem with an example. Discuss its applications.	3	K4
b.	Construct a project network and determine the critical path for the following activities: Activity | Predecessor | Duration (days) A | - | 4 B | A | 5 C | A | 6 D | B | 3 E | C | 4 F | D, E | 2	3	K4

6. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Explain (i) Principle of dominance with an example (ii) Characteristics of a queuing model	4	K2

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b.	Solve the following game using the graphical method: Player A/Player B | B1 | B2 | B3 A1 | 3 | 2 | 4 A2 | 6 | 5 | 1	4	K4

7. Attempt any *one* part of the following: **10 x 1 = 10**

a.	A supplier has introduced quantity discounts to encourage larger order quantities of an item. The price schedule is Order Quantity | Price per Unit (Rs.) 0-299 | 60.00 300-499 | 58.80 500 or more | 57.00 The supplier estimates that its annual demand for the item is 936 units, its ordering cost is Rs.45 per order, and its annual holding cost is 25 percent of the item's unit price. What quantity of the item should the company order to minimize total costs?	5	K4
b.	The data collected in running a machine, the cost of which is Rs. 60,000 are given below: Year | 1 | 2 | 3 | 4 | 5 Resale Value | 42000 | 30000 | 20400 | 14400 | 9650 Cost of Spares | 4000 | 4270 | 4880 | 5700 | 6800 Cost of Labour | 14000 | 16000 | 18000 | 21000 | 25000 Determine the optimum period for the replacement of the machine.	5	K4