PAPER ID-310165

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

BTECH
(SEM VII) THEORY EXAMINATION 2023-24
OPERATIONS RESEARCH

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

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

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

Q no.	Question	Marks
a.	What is the Simplex method in Linear Programming?	2
b.	Define a Two Variable Linear Programming model.	2
c.	In what industries are transportation problems commonly encountered?	2
d.	Define the objective of mathematical models in transportation problems.	2
e.	What is the primary goal of the shortest path model in network techniques?	2
f.	Define the minimum spanning tree problem.	2
g.	What is a rectangular game in the context of game theory?	2
h.	What is the Minimax theorem, and what does it ensure in game theory?	2
i.	How does the EOQ model balance ordering costs and holding costs?	2
j.	Define Reorder Point (ROP) and its significance in inventory management.	2

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a.	Define Operations Research and provide a numerical example illustrating a real-world problem that could be addressed using OR techniques.	10
b.	Define Transportation Problems and distinguish between balanced and unbalanced transportation problems.	10
c.	Explain the concept of the Shortest Path Model in network analysis.	10
d.	Discuss the Minimax Theorem and its significance in game theory. Provide a step-by-step explanation of how the minimax strategy is determined for a player in a given game.	10
e.	Define and explain the Economic Order Quantity (EOQ) model. Discuss the assumptions and limitations of the EOQ model.	10

SECTION C

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

a.	Consider the following linear programming problem: Maximize $Z=3x_1+2x2_2$ Subjected to: $$2x_1 + x_2 \leq 10$$ $$4x_1 - 5x_2 \geq -20$$ $$x_1, x_2 \geq 0$$ Apply the Simplex Method to find the optimal solution.	10
b.	Consider the following linear programming problem:	10

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	Maximize $Z=4x_1+3x_2$ Subjected to : $3x_1 + 2x_2 \leq 12$ $2x_1 - x_2 \geq 2$ $x_1, x_2 \geq 0$ Apply the Dual Simplex Method to find the optimal solution.	

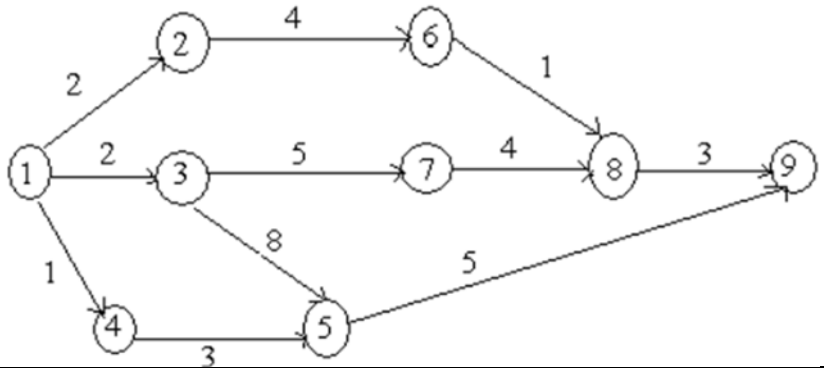
4. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Consider an assignment problem with the following cost matrix: Job 1 Job 2 Job 3 Machine 1 8 6 10 Machine 2 9 7 4 Machine 3 3 2 5 Solve the assignment problem using the Hungarian Algorithm.	10
b.	Consider the following transportation problem: Use the Modified Distribution Method (MODI) to find the optimal solution.	10

	Warehouse 1	Warehouse 2	Warehouse 3	Supply
Destination 1	6	8	10	90
Destination 2	12	14	16	120
Destination 3	18	20	22	150
Demand	80	100	180	

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

a.	Find the critical path and calculate the slack time for the following network	10
b.	A project has the following times schedule	10



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Activity	Times in weeks	Activity	Times in weeks
(1 – 2)	4	(5 – 7)	8
(1 – 3)	1	(6 – 8)	1
(2 – 4)	1	(7 – 8)	2
(3 – 4)	1	(8 – 9)	1
(3 – 5)	6	(8 – 10)	8
(4 – 9)	5	(9 – 10)	7
(5 – 6)	4		

Construct the network and compute 1. T_E (Head event) and T_T (Tail event)for each event 2. Float for each activity 3. Critical path and its duration

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

a.	Find the range of values of p and q which will render the entry (2,2) a saddle point for the game Player B Player A B_1 B_2 B_3 A_1 2 4 5 A_2 10 7 q A_3 4 p 6	10
b.	In a self service store with one cashier, 8 customers arrive on an average of every 5 mins. and the cashier can serve 10 in 5 mins. If both arrival and service time are exponentially distributed, then determine a) Average number of customer waiting in the queue for average. b) Expected waiting time in the queue c) What is the probability of having more than 6 customers In the system	10

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

a.	*Question:* A company sells 5,000 units of a product annually with a holding cost per unit of Rupees 2 and ordering cost of Rupees 100 per order. Calculate the Economic Order Quantity	10
b.	A retailer faces a demand of 200 units per week with a standard deviation of 20 units. The lead time is 2 weeks. Calculate the Reorder Point (ROP) for a desired service level of 95%.	10