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BTECH
(SEM V) THEORY EXAMINATION 2025-26
INDUSTRIAL ENGINEERING

TIME: 3 HRS

M.MARKS: 70

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

SECTION A

1. Attempt all questions in brief.

02 x 7 = 14

Q no.	Question	CO	Level
a.	Differentiate between plant location and plant lay out.	CO1	K2
b.	Define forecasting.	CO2	K2
c.	What do you mean by reorder point in inventory model?	CO3	K2
d.	Define work study.	CO4	K1
e.	What is transportation model and where it is used?	CO5	K2
f.	Explain the dummy activity in network diagram.	CO2	K3
g.	Describe the unbounded solution and no solution conditions with the help of diagram.	CO5	K2

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

a.	An inventory system has a maximum inventory level of 500 units. The inventory is consumed at a constant rate and reaches zero in 1.5 months. Immediately after depletion, the inventory replenishes instantaneously (at an infinite rate) to the maximum level of 500 units, and this cycle repeats throughout the year while sales continue. The ordering cost (O.C.) is ₹500 per order, and the inventory carrying cost is ₹2.5 per unit per month. Determine: (i) The total annual inventory cost. (ii) The Economic Order Quantity (EOQ).	CO1	K3																					
b.	Write short notes on: (i) MRP-I and MRP-II (ii) JIT manufacturing system.	CO2	K3																					
c.	Explain ABC analysis and VED analysis in inventory control with examples.	CO3	K3																					
d.	A project has the following activities: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Activity</th> <th>Duration (days)</th> <th>Predecessors</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>5</td> <td>None</td> </tr> <tr> <td>B</td> <td>7</td> <td>None</td> </tr> <tr> <td>C</td> <td>3</td> <td>A</td> </tr> <tr> <td>D</td> <td>6</td> <td>A</td> </tr> <tr> <td>E</td> <td>4</td> <td>B, C</td> </tr> <tr> <td>F</td> <td>2</td> <td>D</td> </tr> </tbody> </table> Perform the following: (i) Draw the Activity-on-Arrow (AOA) network diagram (use dummy activity if required). (ii) Identify the critical path and the total project duration (in days)	Activity	Duration (days)	Predecessors	A	5	None	B	7	None	C	3	A	D	6	A	E	4	B, C	F	2	D	CO4	K4
Activity	Duration (days)	Predecessors																						
A	5	None																						
B	7	None																						
C	3	A																						
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e.	A firm manufactures two products A and B with a profit ₹4 and ₹5 respectively. The products are made by the machines X and Y. The available machine time in minutes for the machines X and Y are 2000 and 1500 respectively. The time taken to make the product A by machines X and Y are 5 and 4 minutes and for the product B are 3 and 4 minutes respectively. Formulate the LP model for maximization of the profit.		
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SECTION C

3. Attempt any one part of the following: 07 x 1 = 07

a.	A manufacturing company produces two products A and B. Product A requires 2 hours of machining and 3 hours of assembly. Product B requires 4 hours of machining and 2 hours of assembly. Available hours per week: machining = 100 hours, assembly = 90 hours. Profit per unit: A = ₹40, B = ₹60. Formulate as LPP and solve using graphical method.	CO1	K3
b.	What do you mean by process planning? What are the steps of process planning? Also explain the Retrieval type of process planning.	CO1	K3

4. Attempt any one part of the following: 07 x 1 = 07

a.	What is Master Production Scheduling (MPS)? Explain its role in the hierarchy of production planning.	CO2	K3																																										
b.	<p>If the activities, their dependencies, and durations for a project are given in the table below.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Activity</th> <th style="text-align: left;">Predecessor(s)</th> <th style="text-align: left;">Duration (Weeks)</th> </tr> </thead> <tbody> <tr><td>A</td><td>–</td><td>4</td></tr> <tr><td>B</td><td>–</td><td>1</td></tr> <tr><td>C</td><td>A</td><td>1</td></tr> <tr><td>D</td><td>B</td><td>1</td></tr> <tr><td>E</td><td>B</td><td>6</td></tr> <tr><td>F</td><td>C, D</td><td>5</td></tr> <tr><td>G</td><td>E</td><td>4</td></tr> <tr><td>H</td><td>E</td><td>8</td></tr> <tr><td>I</td><td>E</td><td>1</td></tr> <tr><td>J</td><td>G</td><td>1</td></tr> <tr><td>K</td><td>H</td><td>2</td></tr> <tr><td>L</td><td>I, J, K</td><td>5</td></tr> <tr><td>M</td><td>F</td><td>7</td></tr> </tbody> </table> <p>1. Draw the Activity-on-Arrow (AOA) network diagram. Label events (nodes) appropriately. 2. Perform forward and backward pass calculations. Determine for each activity: • Early Start (ES) and Early Finish (EF) • Late Start (LS) and Late Finish (LF) • Total Float (TF) 3. Identify all critical path(s) and state the total project duration.</p>	Activity	Predecessor(s)	Duration (Weeks)	A	–	4	B	–	1	C	A	1	D	B	1	E	B	6	F	C, D	5	G	E	4	H	E	8	I	E	1	J	G	1	K	H	2	L	I, J, K	5	M	F	7	CO2	K4
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5. Attempt any one part of the following:**07 x 1 = 07**

a.	The ratio of variable costs to sales is 70 percent. The break-even point occurs at 60 percent of the capacity. Find the break-even point sales when fixed costs are Rs. 90,000. Also compute profit at 75% of the capacity sales.	CO3	K3
b.	Classify queuing models using Kendall's notation. Explain the operating characteristics (like L_q , W_q) of an M/M/1 queue.	CO3	K4

6. Attempt any one part of the following:**07 x 1 = 07**

a.	Explain the steps involved in conducting a time study using a stopwatch. How is the standard time calculated?	CO4	K3
b.	Explain the steps involved in work measurement. Also explain SIMO chart, How SIMO chart prepared.	CO4	K4

7. Attempt any one part of the following:**07 x 1 = 07**

a.	<p>Formulate the following as a linear programming problem: A manufacturer produces four products: A, B, C, and D, using three machines: M₁, M₂, and M₃. The profit per unit of each product and the processing time (in minutes) required on each machine per unit of product are given in the table below. The daily available machine time for M₁, M₂, and M₃ is 620 minutes, 580 minutes, and 600 minutes respectively.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Product</th> <th>M₁ (min/unit)</th> <th>M₂ (min/unit)</th> <th>M₃ (min/unit)</th> <th>Profit (/unit)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>3</td> <td>2</td> <td>5</td> <td>70</td> </tr> <tr> <td>B</td> <td>2</td> <td>3</td> <td>1</td> <td>85</td> </tr> <tr> <td>C</td> <td>4</td> <td>2</td> <td>4</td> <td>90</td> </tr> <tr> <td>D</td> <td>1</td> <td>3</td> <td>2</td> <td>65</td> </tr> </tbody> </table>	Product	M ₁ (min/unit)	M ₂ (min/unit)	M ₃ (min/unit)	Profit (/unit)	A	3	2	5	70	B	2	3	1	85	C	4	2	4	90	D	1	3	2	65	CO5	K4
Product	M ₁ (min/unit)	M ₂ (min/unit)	M ₃ (min/unit)	Profit (/unit)																								
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B	2	3	1	85																								
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D	1	3	2	65																								
b.	What is an unbalanced assignment problem? How is it converted into a balanced one? Solve a sample 3x3 assignment problem for minimization.	CO5	K3																									