

Subject Code: XXXXX

Roll No:

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**BTECH
(SEM-5) INDUSTRIAL ENGINEERING 2021-22**

TIME:3 HOUR

Total Marks: 100

Instruction: Attempt the questions as per the given instructions. Assume missing data suitably.

SECTION - A

Attempt *All Parts* in Brief

2*10 = 20

Q1	Questions	Marks
(a)	Write short note on productivity.	2
(b)	What is group technology ?	2
(c)	Define forecasting.	2
(d)	What do you mean by scheduling ?	2
(e)	Draw the cost curve for fixed cost, variable cost and total cost.	2
(f)	What is safety stock ? How it is important ?	2
(g)	What are the objectives of standardization ?	2
(h)	What do you understand by ergonomics ?	2
(i)	What are the limitations of graphical method for solving LPP ?	2
(j)	Describe the unbounded solution and no solution conditions with the help of diagram.	2

SECTION - B

Attempt *Any Three* of the following

3*10 = 30

Q2	Questions	Marks
(a)	Describe process and product layout in detail. Also mention benefits and limitations of both.	10
(b)	What is material requirements planning (MRP) ? Discuss its structure in detail. Also describe JIT manufacturing system.	10
(c)	What is break-even point in business ? Show this point on diagram. Explain ABC analysis and VED analysis in inventory control.	10
(d)	What is method study and what are its objectives ? Explain the principle of motion economy in detail.	10

SECTION - C

Attempt *Any One* of the following

5*10 = 50

Q3	Questions	Marks																					
(a)	A firm has adopted simple exponential smoothing with $\alpha = 0.1$ to forecast its demand. The forecast for January was 500 units, whereas actual demand was 450 units. Forecast the demand for February. Assume that actual demand during February is 510 units, forecast the demand for the month of March. Continue forecasting up to June, assuming that subsequent demands were actually 520, 490 and 470 respectively. Also differentiate between PERT and CPM.	10																					
(b)	<p>A network is formed by the following activities. The duration of the activities are given below: Draw the network, calculate the project completion time, identify the critical path and draw a table showing total float, free float, and independent float for each activity.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Activity</th> <th style="text-align: center;">Preceded by</th> <th style="text-align: center;">Duration (Days)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">Starting</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">A</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">C (Terminal)</td> <td style="text-align: center;">D</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">D</td> <td style="text-align: center;">E</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">E</td> <td style="text-align: center;">A</td> <td style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">F</td> <td style="text-align: center;">B</td> <td style="text-align: center;">1</td> </tr> </tbody> </table>	Activity	Preceded by	Duration (Days)	A	Starting	4	B	A	2	C (Terminal)	D	5	D	E	2	E	A	6	F	B	1	10
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A	Starting	4																					
B	A	2																					
C (Terminal)	D	5																					
D	E	2																					
E	A	6																					
F	B	1																					

G	B	2
H (Terminal)	E, G	3
I (Terminal)	F	2

Q4	Questions	Marks
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(a)	<p>For the following set of elements draw the precedence diagram, balance the line and determine (i) Balance delay (ii) Line efficiency (iii) Smoothness index. Assume cycle time as one minute.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 15%;">Element</th> <th style="width: 45%;">Station Time T_{si} (minute)</th> <th style="width: 40%;">Precedence</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.2</td><td>-</td></tr> <tr><td>2</td><td>0.4</td><td>-</td></tr> <tr><td>3</td><td>0.7</td><td>1</td></tr> <tr><td>4</td><td>0.1</td><td>1, 2</td></tr> <tr><td>5</td><td>0.3</td><td>2</td></tr> <tr><td>6</td><td>0.11</td><td>3</td></tr> <tr><td>7</td><td>0.32</td><td>3</td></tr> <tr><td>8</td><td>0.6</td><td>3,4</td></tr> <tr><td>9</td><td>0.27</td><td>6, 7, 8</td></tr> <tr><td>10</td><td>0.38</td><td>5, 8</td></tr> <tr><td>11</td><td>0.5</td><td>9, 10</td></tr> <tr><td>12</td><td>0.12</td><td>11</td></tr> </tbody> </table>	Element	Station Time T_{si} (minute)	Precedence	1	0.2	-	2	0.4	-	3	0.7	1	4	0.1	1, 2	5	0.3	2	6	0.11	3	7	0.32	3	8	0.6	3,4	9	0.27	6, 7, 8	10	0.38	5, 8	11	0.5	9, 10	12	0.12	11	10
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(b)	<p>What do you mean by production system ? How it is classified ? Describe intermittent production system in</p>	10
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Q5	Questions	Marks
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(a)	<p>Explain product life cycle in detail. Also discuss about concurrent engineering.</p>	10
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(b)	What is value engineering ? What are its uses ? Describe the steps involved in value analysis.	10										
Q6	Questions	Marks										
(a)	<p>In a work shop, certain type of machines break-down at an average rate of 6 per hour. The breakdowns are in accordance with Poisson process. The estimated cost of idle machine is 16 rupees per hour. Two repairmen X and Y with different skills are being considered to be hired as repairmen. Repairman X takes six minutes on an average to repair a machine and his wages are 9 rupees per hour, whereas the repairman Y takes five minutes to repair and the wages are 10 rupees per hour. Which repairman's service should be used and why ? Consider the work shift of 8 hours.</p>	10										
(b)	<p>For a production system annual demand is 8000 unit and ordering cost is' 17000 rupees per order and inventory holding cost is 10 % of unit price. Items can be purchased in a lot as given below determine the best order size.</p> <table border="1" data-bbox="154 772 1097 1094"> <thead> <tr> <th data-bbox="154 772 602 837">Lot size</th> <th data-bbox="602 772 1097 837">Unit price (In rupees)</th> </tr> </thead> <tbody> <tr> <td data-bbox="154 837 602 900">1 to 999</td> <td data-bbox="602 837 1097 900">200</td> </tr> <tr> <td data-bbox="154 900 602 963">1000 to 1499</td> <td data-bbox="602 900 1097 963">180</td> </tr> <tr> <td data-bbox="154 963 602 1026">1500 to 1999</td> <td data-bbox="602 963 1097 1026">170</td> </tr> <tr> <td data-bbox="154 1026 602 1094">2000 & above</td> <td data-bbox="602 1026 1097 1094">165</td> </tr> </tbody> </table>	Lot size	Unit price (In rupees)	1 to 999	200	1000 to 1499	180	1500 to 1999	170	2000 & above	165	10
Lot size	Unit price (In rupees)											
1 to 999	200											
1000 to 1499	180											
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2000 & above	165											
Q7	Questions	Marks										
(a)	<p>Two products A and B are to be machined on three machine tools M_1, M_2 and M_3. Product A takes 10 hrs on machine M_1, 6 hrs on machine M_2 and 5 hrs on machine M_3. The product B takes 7.5 hrs on machine M_1, 9 hrs on machine M_2 and 13 hrs on machine M_3. The machining time available on these machine tools M_1, M_2, M_3 are respectively 75 hrs. 54 hrs and 65 hrs per week. The producer contemplates profit of Rs. 80 per product A, and Rs. 100 per product B. Formulate LP model for maximizing the profit and show the feasible region graphically. Find the optimal solution.</p>	10										
(b)	Use Vogel's approximation method to obtain an initial feasible solution of the transportation problem:	10										

	D_1	D_2	D_3	D_4	Available ↓
S_1	11	13	17	14	250
S_2	16	18	14	10	300
S_3	21	24	13	10	400
Demand →	200	225	275	250	