Printed page: 04 Subject Code: AME0603

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

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: VI - THEORY EXAMINATION (2024-2025)

Subject: Industrial Engineering

Time: 3 Hours Max. Marks:100

General Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

1. *This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

	SECTION – A	20
1. Attempt all parts:-		
1-a.	What is the primary goal of industrial engineering? (CO1, K2) A. Reduce profit B. Increase overhead C. Improve productivity D. Increase downtime	1
1-b.	Which of the following is a type of plant layout? (CO1, K2) A. Product layout B. Cubical layout C. Project layout D. Island layout	1
1-c.	In exponential smoothing, what does the smoothing constant alpha determine? (CO2, K3) A. Type of forecast B. Responsiveness to changes C. Inventory level D. Lead time	1
1-d.	PERT is primarily used for: (CO2, K1) A. Deterministic planning B. Random breakdowns C. Probabilistic project analysis D. Queuing optimization	1

1-e.	Break-even analysis is used to determine: (CO3, K1) A. Inventory turnover B. Investment cost C. No-profit-no-loss point D. Financial leverage	1
1-f.	Which inventory model assumes known constant demand? (CO3, K1) A. EOQ B. ABC C. VED D. JIT	1
1-g.	Motion economy is studied in: (CO4, K1) A. Method Study B. Inventory Planning C. Ergonomics D. Demand Forecasting	1
1-h.	Predetermined motion time system (PMTS) is used for: (CO4, K1) A. Routing B. Scheduling C. Standard time setting D. Inventory control	1
1-i.	The MODI method is used to: (CO5, K1) A. Plan layouts B. Find optimal transportation cost C. Design facility D. Predict scheduling	1
1-j.	Linear programming is used to: (CO5, K1) A. Maximize errors B. Minimize delays C. Optimize resources D. Increase slack	1
2. Attempt all parts:-		
2.a.	Define productivity and write its two major measures. (CO1, K2)	2
2.b.	What are the different types of forecasting models**?**(CO2, K2)	2
2.c.	Write the name of different inventory control techniques. (CO3, K2)	2
2.d.	What is work sampling? How is it useful? (CO4, K2)	2
2.e.	What do you mean by degeneracy in a Transportation Problem? (CO5, K2)	2
SECTION – B		30
3. Answer any <u>five</u> of the following-		

<table>
<tr><td>3-a.</td><td>Briefly differentiate between job shop and batch production systems. A manufacturing firm operates both job and batch production systems. Explain how the choice of layout affects productivity and material handling in each case. (CO1, K2)</td><td>6</td></tr>
<tr><td>3-b.</td><td>Explain critical factors influencing the selection of a plant location. (CO1, K2)</td><td>6</td></tr>
<tr><td>3-c.</td><td>A product has shown the following demand over the last 5 months (in units):
<table><tr><th>Month</th><th>Demand</th></tr><tr><td>Jan</td><td>120</td></tr><tr><td>Feb</td><td>135</td></tr><tr><td>Mar</td><td>150</td></tr><tr><td>Apr</td><td>160</td></tr><tr><td>May</td><td>145</td></tr></table>(a) Forecast the demand for June using a 3-month moving average.
(b) Forecast the demand for June using exponential smoothing with α = 0.3 and initial forecast for January as 120.
(c) Based on your results, which method is more responsive to recent demand changes? Justify briefly. (CO2, K3)</td><td>6</td></tr>
<tr><td>3-d.</td><td>A project is composed of the following activities whose time estimates in days are given below. Draw the network, identify the critical path and compute the minimum time required to complete the project.
<table><tr><td>Activity</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr><tr><td>Immediate predecessor(s)</td><td>-</td><td>A</td><td>A</td><td>B</td><td>C</td><td>D,E</td></tr><tr><td>Duration in weeks</td><td>2</td><td>5</td><td>1</td><td>1</td><td>6</td><td>1</td></tr></table>(CO2, K4)</td><td>6</td></tr>
<tr><td>3-e.</td><td>A firm is facing high carrying costs in inventory. Propose a hybrid inventory control system integrating ABC and VED analyses to optimize inventory levels while ensuring critical component availability. (CO3, K4)</td><td>6</td></tr>
<tr><td>3-f.</td><td>State various work measurement techniques. Explain any one of them.(CO4, K2)</td><td>6</td></tr>
<tr><td>3-g.</td><td>Find the initial basic feasible solution using North West Corner method. (CO5, K4)
<table><tr><td></td><td>D_1</td><td>D_2</td><td>D_3</td><td>D_4</td><td>Availability</td></tr><tr><td>O_1</td><td>6</td><td>4</td><td>1</td><td>5</td><td>14</td></tr><tr><td>O_2</td><td>8</td><td>9</td><td>2</td><td>7</td><td>16</td></tr><tr><td>O_3</td><td>4</td><td>3</td><td>6</td><td>2</td><td>5</td></tr><tr><td>Demand</td><td>6</td><td>10</td><td>15</td><td>4</td><td></td></tr></table></td><td>6</td></tr>
<tr><td colspan="2">SECTION – C</td><td>50</td></tr>
<tr><td colspan="2">4. Answer any <u>one</u> of the following-</td><td></td></tr>
<tr><td>4-a.</td><td>Explain the computer-aided process planning (CAPP) with help of block diagram. Also Compare Variant and generative type of CAPP. (CO1, K2)</td><td>10</td></tr>
</table>

<table>
<tr><td>4-b.</td><td>Compare Group Technology with traditional batch production. Explain its impact on throughput, WIP inventory, and setup time in a manufacturing environment. (CO1, K2)</td><td>10</td></tr>
<tr><td colspan="2">5. Answer any <u>one</u> of the following-</td><td></td></tr>
<tr><td>5-a.</td><td>Explain the concept of aggregate production planning and the level production strategy. Design a production plan for a company facing fluctuating monthly demand using the level strategy. Discuss the trade-offs involved in adopting this approach. (CO2, K4)</td><td>10</td></tr>
<tr><td>5-b.</td><td>Explain the concept and significance of critical path in project management. A project has the following activities:
<table>
<tr><th>Activity</th><th>Predecessor</th><th>Duration (days)</th></tr>
<tr><td>A</td><td>-</td><td>3</td></tr>
<tr><td>B</td><td>A</td><td>4</td></tr>
<tr><td>C</td><td>A</td><td>2</td></tr>
<tr><td>D</td><td>B, C</td><td>5</td></tr>
</table>
Draw the network diagram, find the critical path, and calculate the project completion time. (CO2, K3)</td><td>10</td></tr>
<tr><td colspan="2">6. Answer any <u>one</u> of the following-</td><td></td></tr>
<tr><td>6-a.</td><td>Explain the key assumptions and characteristics of an M/M/1 queuing model. A bank wants to reduce customer waiting time. Construct an M/M/1 queuing model using λ = 10 customers/hr and μ = 15 customers/hr. Calculate the average number of customers in the system and in the queue. (CO3, K3)</td><td>10</td></tr>
<tr><td>6-b.</td><td>What is break-even analysis? Explain its importance in production and financial decision-making. A company has fixed cost ₹50,000, variable cost ₹100/unit, and selling price ₹200/unit. Calculate the break-even point in units and discuss how sensitivity to cost changes affects this point. (CO3, K4)</td><td>10</td></tr>
<tr><td colspan="2">7. Answer any <u>one</u> of the following-</td><td></td></tr>
<tr><td>7-a.</td><td>“Various allowances are considered in building up the standard time of a job”. What are these allowances? Why are they given? How are assessed? (CO4, K2)</td><td>10</td></tr>
<tr><td>7-b.</td><td>Design an ergonomic layout for a packaging station handling lightweight items. Discuss how anthropometric data and posture design can enhance both safety and productivity. (CO4, K4)</td><td>10</td></tr>
<tr><td colspan="2">8. Answer any <u>one</u> of the following-</td><td></td></tr>
<tr><td>8-a.</td><td>Find the initial basic feasible solution using Vogel Approximation method (VAM) and find optimal solution to the following transportation problem (CO5, K4)</td><td>10</td></tr>
</table>

	D_1	D_2	D_3	Availability
S_1	1	2	6	7
S_2	8	4	2	12
S_3	3	7	5	11
Requirements	10	10	10	

8-b.	What is the Hungarian method in operations research? Explain its steps and applications in solving assignment problems. Using the Hungarian method, solve the following assignment problem and identify the optimal job assignment:		10

	Job 1	**Job 2**	**Job 3**	**Job 4**
A	8	6	10	9
B	9	12	7	5
C	14	8	12	11
D	10	10	8	6

(CO5, K4)