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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VII - THEORY EXAMINATION (2025 - 2026)

Subject: Elements of Flexible Manufacturing System and Process Engineering

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the 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. Which of the following is a key characteristic of FMS? (CO1, K1)

1

- (a) Limited adaptability
- (b) Low automation
- (c) Fixed production processes
- (d) High adaptability and versatility

1-b. The volume flexibility in manufacturing is (CO1, K1)

1

- (a) The ability to handle high production volumes only
- (b) The ability to handle low production volumes efficiently
- (c) The speed of production
- (d) The adaptability to changes in design

1-c. Part family formation is the process of: (CO2, K1)

1

- (a) Determining the characteristics of different machine parts
- (b) Grouping similar machine parts into families based on common features
- (c) Assigning codes to different parts for identification purposes
- (d) Classifying parts based on their production rate, cost, and surface quality

1-d. What are the key factors that affect surface quality in machining? (CO2, K1)

1

- (a) Cutting speed and tool color
- (b) Operator skill and workpiece material
- (c) Cutting speed and operator experience
- (d) Workpiece material and part variety

1-e. The flow of manufacturing data within an FMS refers to: (CO3, K1)

1

- (a) Data storage techniques
 - (b) Data security protocols
 - (c) Data integration and communication
 - (d) Data visualization methods
- 1-f. The challenge in managing manufacturing data in an FMS is: (CO3, K1) 1
- (a) Ensuring data accuracy and consistency
 - (b) Eliminating all data redundancy
 - (c) Maximizing data storage capacity
 - (d) Avoiding data visualization techniques
- 1-g. What is the benefit of integrating design and manufacturing tolerances? (CO4, K1) 1
- (a) Improved communication between design and manufacturing
 - (b) Enhanced product quality and manufacturability
 - (c) Increased flexibility in manufacturing processes
 - (d) Streamlined production scheduling
- 1-h. Which of the following is an advantage of Automated Guided Vehicles (AGVs) in material handling? (CO4, K1) 1
- (a) Limited flexibility in navigating complex environments.
 - (b) High initial investment cost
 - (c) Reduced labor requirements
 - (d) Higher risk of collision with other equipment
- 1-i. Industrial robots are widely used in material handling due to their ability to: (CO5, K1) 1
- (a) Perform repetitive tasks with high precision
 - (b) Replace human workers entirely
 - (c) Handle only lightweight objects
 - (d) Operate independently without programming
- 1-j. Which type of CAPP involves planning processes based on existing CAD models with little manual intervention? (CO5, K1) 1
- (a) Generative
 - (b) Variant
 - (c) Feature-based
 - (d) CAD-based
2. Attempt all parts:-
- 2.a. What is the need for flexibility in manufacturing systems? (CO1, K2) 2
- 2.b. What is the purpose of Group Technology (GT) in manufacturing? (CO2, K2) 2
- 2.c. What are the challenges in implementing effective machine learning capabilities in an FMS? (CO3, K2) 2
- 2.d. Compare and contrast the advantages and disadvantages of conventional process planning and Computer-Aided Process Planning (CAPP). (CO4, K2) 2
- 2.e. Write down the principle of AS/RS systems. (CO5, K2) 2

SECTION-B

30

3. Attempt all parts:-
- 3.a. Answer any one of the following:-
- 3.a.(i) What are the economic benefits of implementing an FMS in a manufacturing facility? (CO1, K2) 6
- 3.a.(ii) Explain the purpose of cleaning and deburring machines in manufacturing. (CO1, K2) 6
- 3.b. Answer any one of the following:-
- 3.b.(i) Explain the effect of machining parameters on production rate? (CO2, K2) 6
- 3.b.(ii) What are the benefits of using GT in small batch production? (CO2, K2) 6
- 3.c. Answer any one of the following:-
- 3.c.(i) Explain the importance of maintenance in the operation of an FMS. (CO3, K2) 6
- 3.c.(ii) What are the challenges in implementing data analytics in an FMS? (CO3, K2) 6
- 3.d. Answer any one of the following:-
- 3.d.(i) Explain the quantitative methods used for determining optimal index positions and how they help in optimizing production sequences. (CO4, K2) 6
- 3.d.(ii) Explain the concept of tolerance optimization and its role in improving product quality while minimizing manufacturing costs. (CO4, K2) 6
- 3.e. Answer any one of the following:-
- 3.e.(i) Explain the role of conveyors in material handling and their advantages in industrial applications. (CO5, K2) 6
- 3.e.(ii) Discuss the advantages of implementing Automated Storage and Retrieval Systems (AS/RS) in warehouse operations, such as space optimization and inventory accuracy. (CO5, K2) 6

SECTION-C

50

4. Answer any one of the following:-
- 4-a. Explain the the Working and principle of Co-ordinate Measuring Machine (CMM)? (CO1, K2) 10
- 4-b. Explain the concept of virtual simulation in the design and operation of an FMS. (CO1, K2) 10
5. Answer any one of the following:-
- 5-a. Explain the different methods used for cell formation in GT. (CO2, K2) 10
- 5-b. What are the challenges in implementing GT in a manufacturing environment? (CO2, K2) 10
6. Answer any one of the following:-
- 6-a. What are manufacturing data systems and why are they important in an FMS? (CO3, K2) 10
- 6-b. What are the different types of maintenance activities in an FMS? (CO3, K2) 10
7. Answer any one of the following:-
- 7-a. Explain the need for manufacturing tolerances. Describe various methods of tolerance allocation used in manufacturing systems. (CO4, K2) 10
- 7-b. Explain the role of process planning in the manufacturing industry and its impact on 10

product quality and production efficiency. (CO4, K2)

8. Answer any one of the following:-

- 8-a. Write down the principle of conveyor. How conveyors are classified? Also write down the advantages and disadvantages of conveyors. (CO5, K2) 10
- 8-b. Explain the importance of the forward approach in CAPP and how it facilitates early identification of manufacturing constraints and potential issues. (CO5, K2) 10

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