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

B.Tech

SEM: I - THEORY EXAMINATION (2025 - 2026)

Subject: Emerging Trends in Mechanical 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 device is used to convert heat energy into mechanical work? (CO1, K1) 1
- (a) Transformer
- (b) Engine
- (c) Compressor
- (d) Pump
- 1-b. Which of the following is not the type of joining process? (CO1, K1) 1
- (a) Adhesive bonding
- (b) Brazing
- (c) Soldering
- (d) None of the mentioned
- 1-c. Industry 4.0 primarily focuses on: (CO2, K1) 1
- (a) Steam power
- (b) Digitalization and smart manufacturing
- (c) Manual machining
- (d) Water power
- 1-d. Which material is most widely used in additive manufacturing? (CO2, K1) 1
- (a) Concrete
- (b) Thermoplastics
- (c) Glass
- (d) Wood
- 1-e. 3D printing is also known as: (CO3, K1) 1

- (a) Subtractive manufacturing
 - (b) Additive manufacturing
 - (c) Digital sketching
 - (d) Prototyping
- 1-f. Which software is used for designing and drafting ? (CO3, K1) 1
- (a) AUTO CAD
 - (b) MS Excel
 - (c) PowerPoint
 - (d) Notepad
- 1-g. Design for Reliability focusses on (CO4, K1) 1
- (a) Frequent breakdowns
 - (b) Long-term performance consistency
 - (c) Maximum recalls
 - (d) Software dependency
- 1-h. Environmental design ethics focus on: (CO4, K1) 1
- (a) Waste creation
 - (b) Emission reduction and sustainability
 - (c) Product branding
 - (d) Reducing marketing
- 1-i. The Second Industrial Revolution introduced: (CO5, K1) 1
- (a) AI
 - (b) Steam engines
 - (c) Mass production & electricity
 - (d) Cloud computing
- 1-j. A smart factory is enabled by: (CO5, K1) 1
- (a) Assembly lines
 - (b) Wireless telegraphy
 - (c) Cyber-physical systems
 - (d) Windmills
2. Attempt all parts:-
- 2.a. Give an example of an emerging sector in mechanical engineering.(CO1, K1) 2
- 2.b. Name one advantage of using 3D printing in manufacturing. (CO2, K2) 2
- 2.c. Explain difference between rapid prototyping and traditional manufacturing. (CO3, K1) 2
- 2.d. Why is Design for Safety important? (CO4, K2) 2
- 2.e. What is a responsive supply chain system? (CO5, K1) 2

SECTION-B

30

3. Attempt all parts:-

3.a. Answer any one of the following:-

- 3.a.(i) Explain the concept of product design and its importance in manufacturing. (CO1, 6

	K2)	
3.a.(ii)	Explain the role of quality control in maintaining product standards. (CO1, K2)	6
3.b.	Answer any one of the following:-	
3.b.(i)	Explain concept of IOT. (CO2, K2)	6
3.b.(ii)	Explain the working of an electric motor in an EV. (CO2, K2)	6
3.c.	Answer any one of the following:-	
3.c.(i)	Discuss the role of CNC machining in prototype manufacturing. (CO3, K2)	6
3.c.(ii)	Define reliability and sustainability with examples. (CO3, K2)	6
3.d.	Answer any one of the following:-	
3.d.(i)	Explain the concept of design tradeoffs with an example. (CO4, K2)	6
3.d.(ii)	Explain how engineers balance cost, performance, and sustainability. (CO4, K2)	6
3.e.	Answer any one of the following:-	
3.e.(i)	Explain the main features of the Industrial Revolution. (CO5, K2)	6
3.e.(ii)	How does AI improve the efficiency of Industry 4.0? (CO5, K2)	6
<u>SECTION-C</u>		50
4.	Answer any <u>one</u> of the following:-	
4-a.	Compare and contrast the competencies required for traditional and emerging mechanical engineering sectors. (CO1, K2)	10
4-b.	Discuss the role of sustainability in mechanical engineering and the strategies used to achieve it. (CO1, K2)	10
5.	Answer any <u>one</u> of the following:-	
5-a.	Explain the working principle of lithium-ion batteries and their role in EVs. (CO2, K2)	10
5-b.	Discuss the role of power electronics in controlling electric motors and energy management in EVs. (CO2, K2)	10
6.	Answer any <u>one</u> of the following:-	
6-a.	Explain the different types of prototyping and their advantages in engineering design. (CO3, K3)	10
6-b.	Discuss the importance of using CAD and digital simulation in prototype development. (CO3, K2)	10
7.	Answer any <u>one</u> of the following:-	
7-a.	Discuss the principles of Design for Cost and how engineers minimize expenses while maintaining quality. (CO4, K3)	10
7-b.	Analyze the role of Design for Reliability in long-term product performance. (CO4, K3)	10
8.	Answer any <u>one</u> of the following:-	
8-a.	Discuss how Industry 4.0 has transformed supply chain management and logistics. (CO5,K3)	10
8-b.	Discuss the role of Industry 5.0 in sustainable engineering and green manufacturing. (CO5,K3)	10