



Time: 3 hours

Max. Marks: 80

- Note: 1. Assume suitable data if necessary
2. Figures to the right indicate full marks
3. Question No. 1 is compulsory
4. Solve any **three** out of the remaining **five** questions

Q1. Write short notes on following: (Any Four)

- | | | |
|---|----------------------------|---|
| A | Polyelectrolyte gels | 5 |
| B | Biomimetic Materials | 5 |
| C | Types of Magnetostriction. | 5 |
| D | Artificial Muscles | 5 |
| E | Thermoelectric materials | 5 |
| F | Self assembly process | 5 |

Q2.

- | | | |
|---|--|----|
| A | Classify non-polymer based Nano composites. | 5 |
| B | Discuss properties and characteristics of Composite Materials. | 5 |
| C | What is MEMS (Micro-electromechanical systems)? Explain in detail Microsensors and Microactuators used in a MEMS device. | 10 |

Q3.

- | | | |
|---|---|----|
| A | Write different classes of Self Replication. | 5 |
| B | What are the advantages and disadvantages of Hysteresis. | 5 |
| C | What is Magnetostriction? Describe working of Terfenol-D device with the help of neat sketch. | 10 |

Q4.

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|---|---|----|
| A | Describe latest applications of ferrofluids. | 5 |
| B | Describe synthesis of Piezoelectric materials. | 5 |
| C | What is Soft matter? Describe it's properties and applications. | 10 |

Q5.

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|---|--|----|
| A | Describe applications of Shape memory alloys. | 5 |
| B | Write short note on Hydrogen storage. | 5 |
| C | What are the various Energy Harvesting challenges? Explain Vibration energy Harvesting techniques. | 10 |

Q 6.

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|---|--|----|
| A | What are the six basic steps of the LIGA process | 5 |
| B | Describe top-down and bottom-up approaches of self assembly. | 5 |
| C | Write short note on:
1. Laminated Object Manufacturing (LOM)
2. Fused Deposition Modelling (FDM) | 10 |