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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations – JANUARY-2025** |
| **Date:** 09-01-2025 **Time:** 9.30 am to 12.30 pm |

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| **School:** SOE | **Program:** B. Tech (MEC) | |
| **Course Code :** MEC3014 | **Course Name :** Smart Materials | |
| **Semester**: VII | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** |
| **Marks** | **30** | **30** | **40** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 2 marks. 10Q x 2M=20M** | | | | |
| **1** | What are piezochromic materials? | **2 Marks** | **L1** | **CO1** |
| **2** | Define thermoelasticity? | **2 Marks** | **L1** | **CO1** |
| **3** | What is the difference between fibres and particles? | **2 Marks** | **L1** | **CO1** |
| **4** | Difference between smart materials and conventional materials. | **2 Marks** | **L1** | **CO1** |
| **5** | Name any four smart materials. | **2 Marks** | **L1** | **CO1** |
| **6** | What are smart materials? | **2 Marks** | **L1** | **CO2** |
| **7** | Define composite materials. | **2 Marks** | **L1** | **CO2** |
| **8** | Advantages of smart materials | **2 Marks** | **L1** | **CO2** |
| **9** | What do you understand by the term damping capacity? | **2 Marks** | **L1** | **CO2** |
| **10** | Draw figures for unidirectional and bi-directional fibrous composite materials. | **2 Marks** | **L1** | **CO2** |

**Part B**

**Answer the Questions Total 80 Marks**

|  |  |  |  |  |
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| **11.** | 1. What is a shape memory alloy? Explain the Shape memory effect in NiTiNoL in terms of phase transformation. 2. Explain Pseudo-elasticity. Classify the types of shape memory alloy | **10 Marks**  **10 Marks** | **L2** | **CO3** |
| **OR** | | | | |
| **12.** | 1. Explain optical fiber. Classify it based on the number of modes and reflective index. 2. Mention the advantages, disadvantages and application of optical fibers. | **10 Marks**  **10 Marks** | **L2** | **CO3** |
|  |  |  |  |  |
| **13.** | 1. Describe Sensors and actuators. Write 3 applications of sensors and actuators. 2. Briefly explain the future application of piezoelectric smart materials. | **10 Marks**  **10 Marks** | **L3** | **CO2** |
| **OR** | | | | |
| **14.** | 1. Write an overview of piezoelectricity in polymers.      1. Explain electrorheological materials with some practical applications. | **10 Marks**  **10 Marks** | **L3** | **CO2** |

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| **15.** | 1. Explain the optical fiber sensing mechanism. 2. Differentiate between electrostrictive material and piezoelectric materials in 5 points. | **10 Marks**  **10 Marks** | **L3** | **CO3** |
| **OR** | | | | |
| **16.** | 1. Define magnetorheological fluid. Write the basic composition and application of these fluids. 2. Write the general principle used in the design of smart memory alloy actuators. | **10 Marks**  **10 Marks** | **L3** | **CO3** |

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| **17.** | 1. Define chromic materials. Classify chromic materials based on their stimuli. 2. Explain the fabrication process of MEMS using the thermal oxidation method. | **10 Marks**  **10 Marks** | **L3** | **CO1** |
| **OR** | | | | |
| **18.** | 1. Explain the steps involved in the microfabrication process i.e. photolithography. 2. Explain briefly the flow process involved in the fabrication of microelectronics. | **10 Marks**  **10 marks** | **L3** | **CO1** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***