Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

Course:	**Introduction to smart Materials**	**Semester:**	**VI**
Program:	**B Tech AMNT**	**Time:**	**03 hrs.**
Course Code:	**MECH3052**	**Max. Marks:**	**100**

Instructions:

Answer all questions.
Read each question carefully before answering.
Provide clear explanations where necessary.
Use diagrams or sketches to support your answers when appropriate.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define smart materials and provide examples of how they differ from traditional materials.	**4**	**CO1**
Q 2	Describe the mechanism of action for thermochromic materials and discuss their significance in energy conservation.	**4**	**CO1**
Q 3	Explain the concept of self-healing materials and provide examples of their applications in real-world scenarios.	**4**	**CO2**
Q 4	What is the chemical composition of lead zirconate titanate (PZT), one of the most commonly used piezoelectric materials? Also, mention one unique property of PZT that makes it suitable for various applications.	**4**	**CO2**
Q 5	Describe two common methods used to manufacture piezoelectric materials briefly explain one advantage of each approach.	**4**	**CO2**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Explain the concept of stimuli-responsive materials and identify the types of stimuli they can respond to.	**10**	**CO1**
Q 7	Critically assess the societal implications of widespread adoption of smart materials in consumer products, addressing concerns such as privacy, accessibility, and socio-economic disparities.	**10**	**CO4**
Q 8	Discuss the potential benefits of utilizing smart polymers in responsive materials and devices.	**10**	**CO2**
Q 9	Explain the concept of smart polymers in your own words. Provide three examples of stimuli that can trigger a response in smart polymers, and describe a practical application for each example.	**10**	**CO2**
SECTION-C **(2Qx20M=40 Marks)**			

Q 10	Discuss in detail on the phase transformation mechanism in Shape Memory Alloys (SMAs), accompanied by clear schematic representations.	**20**	**CO3**
Q 11	Design a conceptual framework for a smart city project that leverages advanced smart materials to enhance urban sustainability and resilience. Consider key elements such as energy management, waste reduction, transportation efficiency, and public safety. Evaluate the potential benefits and challenges of implementing such a project, and propose strategies to overcome barriers and ensure equitable access to smart technologies for all residents. or Develop a proposal for a research project exploring novel applications of smart materials in aerospace engineering, considering factors such as lightweight construction and enhanced performance.	**20**	**CO4**