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Total Number of Pages: 02

Course: M.Sc.I
Sub_Code: FPYE1008

10th Semester Regular Examination: 2024-25
SUBJECT: MATERIAL SCIENCE
BRANCH(S): M.SC.I(AP)
Time: 3 Hours
Max Marks: 70
Q.Code: S153

Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)
The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) What is the significance of the elastic region in a stress-strain curve and how tensile strength is determined from a stress-strain curve?
- b) Mention the name of any two materials commonly used in thermoelectric devices. How does thermal conductivity affect thermoelectric efficiency?
- c) What is the piezoelectric effect? Mention two applications of piezoelectric materials.
- d) Define Q-switching and mention its significance in laser pulse generation.
- e) Name one advantage of CW laser operation in materials processing and give an example of a laser type commonly used in CW operation.
- f) Mention two advantages of using optical fibers over traditional metallic wires in communication.
- g) Why are initiators necessary in chain-growth polymerization but not in step-growth polymerization?
- h) What are the primary functions of the matrix in a fibre reinforced composite?
- i) What is a hybrid composite? Provide an example of a hybrid composite and its application.
- j) What is a shape memory alloy (SMA). Name two commonly used shape memory alloys.

Part-II

Long Answer Type Questions (Answer Any five)

- Q2**
- a) Define ductile and brittle materials. Compare their mechanical behavior with suitable examples. (5)
 - b) Explain the concept of energy bands in solids. How they determine the electrical conductivity of conductors, semiconductors, and insulators? (5)
- Q3**
- a) Explain the concept of fatigue in materials and describe the stages leading to fatigue failure. (5)
 - b) Explain the significance of the Meissner effect in superconductors and how it differs between Type I and Type II superconductors. (5)

- Q4** a) Define the threshold condition in laser operation and obtain an expression for it. (5)
b) What is an optical resonator? With a suitable diagram describe the construction and working of a resonator. (5)
- Q5** a) Mention the features of a solid state laser. With a suitable diagram describe the construction and working of a Ruby laser and some of its applications. (5)
b) With a suitable energy level diagram describe the features of four level pumping scheme. How is it efficient than three level pumping schemes? (5)
- Q6** a) What do you mean by Thermoplastics and Thermosetting Plastics? Explain the polymerization processes involved in the synthesis of thermoplastics. (5)
b) Define micro composites and macro composites. Explain how macro composites are utilized in structural applications. (5)
- Q7** a) Differentiate between continuous fibre composites and short fibre composites. (5)
b) Explain how the orientation and length of fibres in short fibre composites influence their mechanical properties. (5)
- Q8** a) Explain the crystal structures commonly found in ceramic materials and how these structures influence their properties. (5)
b) Define nanophase materials and explain the mechanical properties of nanophase ceramics. (5)