

M. Tech. Mechanical Engineering Design (CBCS Pattern) Semester-I
MED15(A) - Advanced Engineering Materials

P. Pages : 2

Time : Three Hours



GUG/W/24/14190

Max. Marks : 70

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- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and Chemical equation should be given wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Solve **any five**.

1. a) Classify 'Composites' in detail. What unique properties they have over the conventional materials? **7**
b) Assuming Iso-strain condition, derive an equation for the modulus of elasticity of the composite in terms of the elastic moduli of the matrix and the fiber material. **7**
2. a) Compare and contrast between thermoplastic and thermoset plastic material with suitable example. **7**
b) What are the design and selection criterions for following? **7**
 - i) Materials for passive solar heating
 - ii) Flywheels
3. a) Write short note on following: **7**
 - i) Micro-alloyed steel
 - ii) Bio-compatible materials
b) What are composites? Explain the role of matrix material in a composite. Give two examples of particulate reinforced metal matrix composites. **7**
4. a) A glass fiber reinforced polystyrene contains 40 volume % of parallel fibers. Estimate the young's modulus of the composite in the longitudinal direction of the fibers. Young's modulus of glass is 60 GN m^{-2} and that of polystyrene is 2.6 GN m^{-2} . **7**
b) Draw Fe-Fe₃C phase equilibrium diagram showing critical lines, critical temperatures and composition. **7**

5. a) Discuss the structure and applications of any four thermoplastic and any four thermoset plastic materials. 7
- b) What is 'equivalent carbon' in Cast irons? How this term is useful? Compare and contrast between white cast iron and gray cast iron. 7
6. a) Write short notes on following: 7
- i) Alloy cast iron ii) Rule of mixture
- b) Explain the following: 7
- i) Materials for high temperature wear application
- ii) Application of reactive metals.
7. a) What are ceramics? List and briefly explain five important properties of ceramics that make them useful engineering materials. 7
- b) Write short note on following: 7
- i) Angle piled composites ii) Design of 'honeycomb structure'
8. a) Explain the importance of 'Material selection' in mechanical design with suitable example. 7
- b) What do you mean 'Bio-compatible' material? Give some example with the help of suitable ternary phase diagram. 7
