

Registration No. :

--	--	--	--	--	--	--	--	--	--

Total number of printed pages – 2

B. Tech
PCMT 4404

Eighth Semester Regular Examination – 2015
MATERIALS FOR ADVANCED APPLICATIONS

BRANCH (S) : MM, MME

QUESTION CODE : J 157

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.*



1. Answer the following questions : 2 × 10
- What is smart or intelligent material ?
 - Define Shape Memory Alloys (SMA). What are the different shape memory effects (SME) of SMAs ?
 - Define Super alloy. What are the different types of super alloys ?
 - What are Cellular materials ? What quantitative results are obtained from the microstructure of metal foams ?
 - What are HSLA steels ? Give one example of HSLA steels.
 - Define Heat resistance Steels ? What are the different types of heat resistant steels ?
 - Define Nanocomposites. What are its applications ?
 - Define Biocompatibility.
 - Define Sputtering method of thin film deposition.
 - Cite one similarity and two differences between precipitation hardening and dispersion strengthening.
2. What are the different types of titanium alloys based on their microstructure ? Explain with suitable diagram the thermo mechanical processing of β and $\alpha + \beta$ titanium alloys. 10

P.T.O.

3. A continuous and aligned fibrous reinforced composite having a cross-sectional area of 970 mm^2 is subjected to an external tensile load. If the stresses sustained by the fiber and the matrix phases are 215 MPa and 5.38 MPa respectively, the force sustained by the fiber phase is 76,800N, and the total longitudinal composite strain is 1.56×10^{-3} , then determine : 10
- (a) The force sustained by the matrix phase
 - (b) The modulus of elasticity of the composite material in the longitudinal direction
 - (c) The moduli of elasticity for fiber and matrix phases.
4. (a) Explain the different phases present in nickel based super alloys. Write about the strengthening mechanisms and applications of nickel based super alloys. 5
- (b) Explain with suitable diagram the method of processing cellular materials by gas injection technique. 5
5. (a) Explain with suitable diagram the solid state processing of cellular materials using space holding fillers. 5
- (b) Name the various methods for characterizing metal foams. Explain briefly the various applications of metal foams. 5
6. (a) What are TRIP steels ? Explain the heat treatment schedule of TRIP steel using a suitable phase diagram. 5
- (b) Derive an expression for the modulus of elasticity for a continuous and aligned fibrous composite loaded in the direction of alignment. 5
7. (a) What are Biomaterials ? Name the different types of Biomaterials. Discuss briefly the major applications of Biomaterials in medicine and dentistry. 5
- (b) What are the different types of High Speed steels ? Give one example of each. Explain with suitable diagram the heat treatment cycle of High Speed steels. 5
8. Write short notes any two of the following : 5×2
- (a) Maraging Steels
 - (b) Chemical Vapor Deposition
 - (c) Dual Phase Steel
 - (d) Titanium shape memory alloy.

