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BME-018

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. AEROSPACE ENGINEERING (BTAE) / BTMEVI

01045 **Term-End Examination**

December, 2014

BME-018 : ENGINEERING MATERIALS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. (a) Show by a suitable stress-strain diagram, elastic limit, upper and lower yield points and plastic and elastic deformation of a ductile metal. 7

(b) Prove that the strain energy stored in a material is the area of the stress-strain curve. A steel wire specimen shows its yield stress as 190 MPa. If this variety of steel shows a Modulus of Resilience of 150×10^{-6} N-m/mm^2, what percentage increase in the yield stress would be required by strain-hardening considering Young's Modulus of the material of the specimen as 150×10^{-6} N/mm^2 ? 2+5

2. (a) What is creep in metal ? Describe how a metal will progressively deform at high temperature under a constant stress. *7*

(b) Explain the terms stress-concentration and stress-relaxation. Give examples of each. *7*

3. (a) What is iron-carbon equilibrium diagram ? State the different information obtained from this diagram. *7*

(b) What is Tempering ? Discuss the various changes in properties of metals and alloys observed along with their grain structures at different temperatures of tempering. *7*

4. (a) What is T-T-T curve ? What purpose does this curve serve ? *7*

(b) Explain the killed and semi-killed steels. *7*

5. (a) What are ceramics ? Explain how the properties of ceramic materials enables one to select them for use in engineering. *6*

(b) What materials are normally used for the following aircraft components ? Mention their heat treatment requirements.

(i) Rivets for joining structural assemblies

(ii) Oil tank

(iii) Hub of propeller

(iv) Landing gear *8*

6. (a) What is the effect of cold working on mechanical properties of metals and alloys ? 7

(b) What changes in the properties and structures of a material are observed when it is subjected to Annealing at successive higher temperatures after it has been severely cold worked ? 7

7. (a) The following data were obtained while testing a m.s. bar specimen in a Universal Testing Machine :

(1)	Diameter of the specimen	25 mm
(2)	Length of the specimen	300 mm
(3)	Extension under 15 kN load	0·045 mm
(4)	Yield point load	127·65 kN
(5)	Maximum load	208·60 kN
(6)	Length of the specimen after fracture	375 mm
(7)	Neck diameter of the specimen	17·75 mm

Find : *14*

(i) Young's Modulus

(ii) Yield Point

(iii) Ultimate Tensile Stress

(iv) Percentage elongation

(v) Percentage reduction in area

(vi) Safe working stress assuming factor of safety of 3·5 on ultimate stress and 1·6 on yield stress

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