Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50863

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third/Fourth Semester
Mechanical Engineering
ME 6403 – ENGINEERING MATERIALS AND METALLURGY
(Common to Automobile Engineering/Manufacturing Engineering/Mechanical and Automation Engineering)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Draw a typical isomorphous phase diagram.
2. Why carbon content in austenite is higher than ferrite ?
3. What is difference between stress relief and recrystallization heat treatment process ?
4. Which has higher critical cooling rate: eutectoid steel or hypereutectoid steel ? Justify.
5. Which type of stainless steel is non magnetic ?
6. What is the role of boron in steel alloying ?
7. What are outstanding properties of PTFE ?
8. List the typical applications of SiC.
9. What are the characteristic features of brittle fracture ?
10. State hardness whether corresponds to ultimate tensile strength or yield strength ? Justify ?

PART – B (5×13=65 Marks)

11. a) i) Draw Iron-Iron carbide phase diagram, name the various field, line and reactions. **(10)**

ii) Find the wt. fraction of ferrite and cementite of eutectoid steel. **(3)**

(OR)

b) Compare the microstructure and properties of various cast iron.

12. a) Brief on hardening and tempering of steel.

(OR)

b) Compare different types of case hardening process.

13. a) Brief on the influence of alloying elements in steel under classification of α and γ stabilisers.

(OR)

b) i) What are the classification of aluminium alloys and state the applications of any THREE alloy. **(7)**

ii) Brief on the mechanism of ageing treatment of Al-Cu alloy. **(6)**

14. a) i) Classify composite materials based on the type of reinforcement and state an example of each. **(7)**

ii) State the properties and applications of two ceramics from the list : PSZ, Si_3N_4, Al_2O_3 and SIALON. **(6)**

(OR)

b) i) List properties and applications of any three type of ceramics. **(7)**

ii) Brief on properties and applications of any two polymers from the list.

PP, PC, PEEK, ABS and PS. **(6)**

15. a) i) Compare slip and twinning. **(4)**

ii) Draw a typical creep curve and brief on the mechanism. **(9)**

(OR)

b) i) Draw a typical tensile test curve of metallic sample, mark the different points/ regions that represent different mechanical properties. **(4)**

ii) Draw a typical S-N curve of fatigue testing and brief on the mechanism. **(9)**

PART – C (1×15=15 Marks)

16. a) i) Explain why certain alloys are heat treatable, some are castable and other wrought ? **(8)**

ii) Suggest an material of choice for application as orthopaedic implant (or) brake drum of automobile. Justify your choice, based on the properties of materials and method of production. **(7)**

(OR)

b) Compare and contrast Brinell, Vickers and Rockwell hardness test technique, advantages and disadvantages. **15**

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