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A – 4174

Reg. No. :

Name :

**Fourth Semester B.Tech. Degree Examination, June 2016
(2013 Scheme)**

**13.404 : METALLURGY AND MATERIAL SCIENCE
(MNPU)**

Time : 3 Hours

Max. Marks : 100

Instruction : Answer *all* questions from Part – A and *One full* question from *each* Module of Part – B.

PART – A

(10×2 = 20 Marks)

1. Explain the importance of slip systems.
2. What are the properties of a metal which is determined by the atomic and crystalline structures?
3. Explain the effects of fine and coarse grain size on dislocation movement.
4. Describe the kind of fracture which may occur as a result of fitting a loose key on a shaft.
5. Explain the difference between self diffusion and inter diffusion.
6. Distinguish between TTT and CCT.
7. Distinguish between Eutectic and Eutectoid reactions.
8. Identify the alloy 18:4 :1.
9. What are the functions of a matrix and reinforcing element in a composite metal ?
10. Explain the fundamental of nano structures possesses high strength.



PART – B

(4×20 = 80 Marks)

Module – 1

11. Explain Hall-Petch relation. Explain the effect of fine and coarse grain sizes on mechanical strength. Fine or coarse grain size is preferred for creep applications. Explain with neat sketches.

OR

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12. a) Explain the significance of long range and short range order of atomic arrangement in a crystal structure on mechanical strength. 4
- b) Explain various steps in metallographic specimen preparation. What is the need of etching process ? Which portion will be normally more etched on the structures during etching process ? 16

Module – 2

13. A small hole is drilled through a steel plate ahead of a crack, whether it can stop the Crack's progress until repairs can be made. Explain in detail and derive the equation for the principle.

OR

14. Postulate with neat sketches, why 100% pure metals are weak in strength ? What is the primary function of adding alloying elements into pure metals ? Explain the effects of adding alloying elements in interstitial and substitution solid solutions with neat sketches.

Module – 3

15. Why tempering done after hardening ? Explain with neat sketches the processes of austempering, martempering and ausforming and distinguish between them.

OR

16. a) Explain Iron Carbon equilibrium diagram with microstructures. 12
- b) Distinguish between the properties of martensite, pearlite, ferrite and bainite with microstructures. 8

Module – 4

17. Explain the fundamental effects of alloying elements in steel on polymorphic transformation temperatures, grain growth, eutectoid point, retardation of the transformation rates, formation and stability of carbides.

OR

18. a) On the basis of microstructure, explain why gray iron is brittle and weak in tension.
- b) What are the important alloys of Titanium ? Explain their applications.