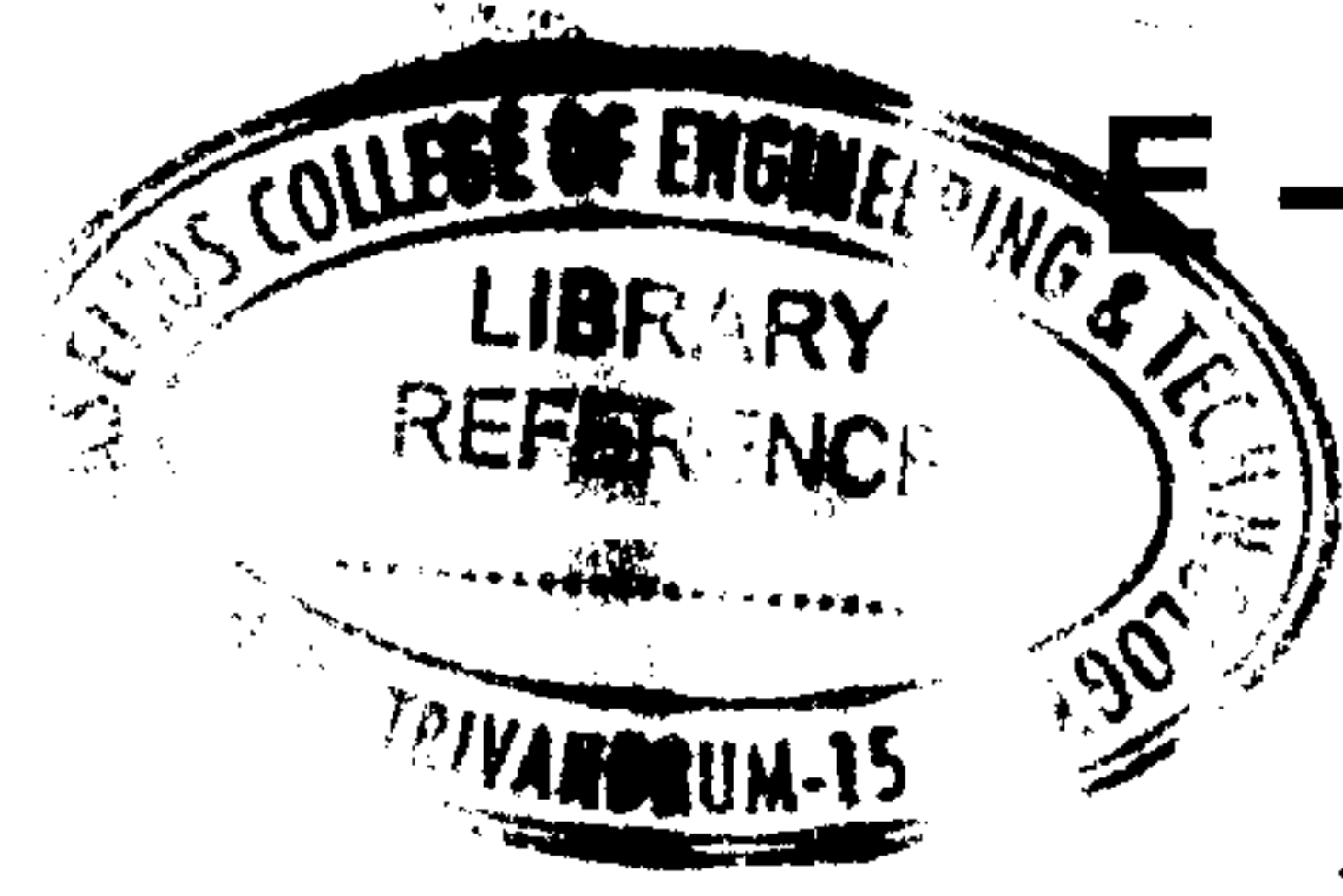




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E - 4177

Reg. No. : .....

Name : .....

**Fourth Semester B.Tech. Degree Examination, August 2018  
(2013 Scheme)**

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

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer *all* questions from Part – A.  
2) Answer *any one* question from *each* module of Part – B.

**PART – A**

1. What are the features of metallic bonding ?
2. What are the two types of line defects ?
3. Give the Hall-Petch equation.
4. What is meant by fatigue ?
5. What are solid solutions ? How are they classified ?
6. Draw the cooling curve of pure iron.
7. Why martensite is not shown in Fe-C diagram ?
8. What is austempering ?
9. What is meant by duplex steels ?
10. What is meant by nanomaterials ? (10×2=20 Marks)

**PART – B**

**Module – I**

11. a) With the help of neat sketches, explain edge dislocation and screw dislocation. 12
- b) Compare *Ceramics* and *Composites*. 8
12. a) Give a detailed account of the types of the surface imperfections. 10
- b) Explain elastic, anelastic and visco elastic behavior of materials. 10

P.T.O.

**Module - II**

13. a) Draw the typical S-N diagrams for steel and aluminium and comment on them. Discuss about the factors affecting fatigue. 1
- b) List the mechanisms of diffusion in solids and explain any two of them with sketches. 10
14. a) Explain the Hume-Rothery rules for substitutional solid solutions. 8
- b) Draw the Pb-Sn phase diagram and explain the mode of solidification of an alloy containing 75% Pb. 12

**Module - III**

15. a) Explain the mode of solidification of a hypereutectoid steel with the help of Fe-C phase diagram. 14
- b) Explain the features of bainite and austenite. 6
16. a) Explain the procedure for Jominy test to get the hardenability data. 10
- b) What is surface hardening ? Explain with neat sketch, induction hardening process, stating its advantages. 10

**Module - IV**

17. a) Bring out the effects of the following alloying elements on steel :
- |               |                |
|---------------|----------------|
| i) Nickel     | ii) Chromium   |
| iii) Tungsten | iv) Silicon    |
| v) Vanadium   | vi) Manganese. |
- b) Explain the stir casting process with a sketch. 8
18. a) Explain the composition and uses of the following : 10
- |                     |                     |
|---------------------|---------------------|
| i) High speed steel | ii) Titanium alloys |
| iii) S.G. Iron      | iv) Y-alloy         |
- b) Explain about the fabrication method for fibre reinforced laminates. 10
-