M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.
Elective
Manufacturing Engineering
MF 7017 — MATERIALS TESTING AND CHARACTERIZATION TECHNIQUES
(Regulations 2013)
Time: Three hours
Maximum: 100 marks
Answer ALL questions.

PART A — (10 x 2 = 20 marks)

1. What do you understand by ASTM grain size number?

2. Define Bragg’s law.

3. What are the characteristics that can be identified by using bright field and dark field imaging?

4. Write various application of EPM.

5. What do you mean by Auger electrons?

6. Mention the characteristics that can be identified by using DSC.


8. What is proof stress?

9. What is the significance of S-N curve?

10. Distinguish LCF and HCF.
PART B — (5 × 13 = 65 marks)

11. (a) Briefly explain the following:
   (i) Any two methods of determining ASTM grain size. (7)
   (ii) Sequence of specimen preparation for optical microscopy. (6)

Or

(b) Briefly explain the operating principles of X-ray diffraction techniques with neat sketch. Discuss Debye-Scherer method for study of crystal structure.

12. (a) With a general diagram of SEM, explain the functions of various components, working principle of SEM and applications.

Or

(b) With neat sketch, explain the construction and working principles of AFM.

13. (a) Write a brief note on the basic principle, working components and application of Wave Dispersive of X-Ray spectrometry with neat sketch.

Or

(b) What is Thermal analysis? With a labeled sketch a DTA equipment explain its working. Differentiate DTA and DSC techniques.

14. (a) (i) Write down the steps involved in conducting uniaxial tensile test. How to determine resilience and fracture toughness of the natural? (7)

(ii) Draw the stress strain curve and label. Derive a relation between True stress and Engineering stress and True strain and Engineering strain. (6)

Or

(b) (i) Explain the methodology of fracture toughness test, standards for testing the metallic and composite materials. (7)

(ii) Discuss the need for codes and standards for testing metallic materials. (6)
15. (a) (i) Explain the methodology of conducting rotating beam fatigue testing and how to generate S-N curve.  
(ii) What are the pitfalls of S-N curve technique?  

Or

(b) (i) Draw and label the 3 stages of a creep test. 
(ii) Explain any one method of pressing the creep data.

PART C — (1 × 15 = 15 marks)

16. (a) Explain about the microstructure of the engineering materials, interplaner spacing and identification of crystal structure.

Or

(b) What is characterization? State its importance in material science. Write the advantages and disadvantages of chemical thermal analysis and mechanical testing.