Roll No……..….. **Total No. of Printed Pages: [1]**
Total No. of Questions: [09]

B. Tech. (Mech. Engg.) (Semester – 4th)
MATERIALS ENGINEERING
Subject Code: BMECS1401
Paper ID: [18112315]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Explain the activation energy of diffusion.
b. Draw a BCC unit cell and calculate the number of atoms in this unit cell.
c. What is meant by allotropy?
d. Define Polymorphism
e. What are the carbon percentages in ferrite and cementite?
f. What is the difference between hardness and harden ability?
g. What is normalising?
h. Explain Critical cooling rate.
i. What do you mean by yielding of ductile materials?
j. What is Ultra-high strength steel?

Section – B **(5 marks each)**

Q2. What are the basic difference between edge, screw and mixed dislocations?

Q3. What is alloying? Explain the effect of addition of sulphur and phosphor on stability of iron.

Q4. How crystal growth can be enhanced? Discuss various methods

Q5. What are the properties of ferrous materials explain any two of them in detail.

Q6. What is case hardening process? Explain the flame hardening process in brief.

Section – C **(10 marks each)**

Q7. Draw and neatly label the iron carbon diagram. Explain the various reactions involved while cooling and heating of steel.

Q8. Describe the carburizing and nitriding process of case hardening with the help of suitable diagrams.

Q9. On what basis the alloying elements are classified? Discuss the effects of adding Si, Mn and Mo as alloying elements in steels.