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**309402**

**May, 2019**

**B.Tech. (AE/MAE/ME) - IV SEMESTER  
MATERIALS ENGINEERING  
(PCC-AE-204/PCC-MAE 204/PCC-ME-204)**

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume any suitable data if needed.*

**PART-A**

1. (a) Define coordination number for any crystal structure. (1.5) CO1
- (b) How ceramics differ from alloys? (1.5) CO6
- (c) How is young's modulus important for engineering materials? (1.5) CO2

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- (d) How does Vickers indenter differ from Brinell Indenter?  
(1.5) CO2
- (e) Illustrate the fatigue limit with the help of S-N curve.  
(1.5) CO3
- (f) For what types of materials does normal stress theory of failure apply and why?  
(1.5) CO3
- (g) Draw a characteristic unary phase diagram by showing phases on it.  
(1.5) CO4
- (h) Illustrate Peritectic reaction with respect to Fe-C system.  
(1.5) CO4
- (i) Show Austempering process on an isothermal TTT curve.  
(1.5) CO5
- (j) Differentiate between brass and bronze on the basis of their composition.  
(1.5) CO6

### PART-B

- 2. What are unit cell parameters? Illustrate seven crystal systems with the help of neat diagrams and their unit cell parameters.  
(15) CO1
  
- 3. (a) Compare between the true stress strain and engineering stress strain diagrams with the help of neat illustration.  
(7.5) CO2
- (b) Compare between the Rockwell and Brinell hardness tests.  
(7.5) CO2

- 4. Discuss the advantages of nondestructive testing of materials over destructive testing. Describe magnetic particle testing and Eddy current testing methods in detail. (15) CO3
  
- 5. Explain the cooling of 0.5% carbon steel from liquid state to room temperature with help of Iron-Carbon phase diagram and interpret the microstructure developed during the process by neat illustrations. (15) CO4
  
- 6. (a) Why is heat treatment needed in case of alloys? Differentiate between the isothermal TTT curve and continuous cooling curve. (10) CO5
- (b) How is flame hardening different from carburizing?  
(5) CO5
  
- 7. Write notes on following :
  - (a) Stainless steels and their types. (5) CO6
  - (b) Types of cast iron. (5) CO6
  - (c) Nickel based super-alloys. (5) CO6