Total No. of Questions : 10]

SEAT No. :

PE-5793

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[6582]-298
S.Y. (Mechanical/Mechanical S.W.)
PCC-203-MEC : ENGINEERING MATERIALS & METALLURGY
(2024 Pattern) (Semester - III)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume Suitable data if necessary.*

Q1) a) Draw the planes for **[6]**

i) (10-1)

ii) (2 1 0)

iii) (11 –1)

b) Differentiate between destructive testing and nondestructive testing. State principle and explain radiographic testing with suitable diagram. Enlist its applications. **[8]**

OR

Q2) a) Is etching of a metallographic sample always necessary? Justify. Enlist and explain steps in process used for preparation of metallographic sample under optical microscope. **[7]**

b) With the help of a neat sketch explain the difference in the flow lines observed in forged components and cast components. **[7]**

Q3) a) Explain the terms 1] Solid solution 2] Alloy. Explain the factors that govern Hume Rothery's rules of solid solubility. **[6]**

b) Draw Iron Carbon equilibrium diagram showing all the details like temperature, composition, phases, critical lines & invariant reactions. **[8]**

OR

Q4) a) Explain the Eutectic, Partial Eutectic and Isomorphous systems. **[8]**

b) Draw the cooling curve for pure metal and binary solid solution and apply phase rule for it. **[6]**

P.T.O.

Q5) a) State the importance of Time Temperature Transformation (TTT) diagram in heat treatment processes. Plot the isothermal TTT diagram with proper details. **[8]**

b) Differentiate between Annealed and Normalized components with the help of the following criteria : **[6]**

i) Tensile strength

ii) Microstructure

iii) Grain size distribution

iv) Internal stresses

OR

Q6) a) State whether the following statements are True or False and justify your choice correctly. **[6]**

i) Martensite is a soft phase.

ii) Hardening of steel is always followed by tempering.

iii) Hardness is the same property as hardenability.

b) State the difference between Case hardening and surface hardening. Explain with neat sketch Flame hardening and its applications. **[8]**

Q7) a) Explain in detail IS, AISI, SAE designations. Mention the names of alloying elements used and the amount of alloy present the following steels. **[7]**

i) AISI 1040

ii) Fe 410 K

iii) 80 T 11

iv) 30Ni4Cr2Mo1

b) Explain the term Stainless Steel? Classify and explain the types of it. Also explain the term Sensitization of Stainless Steel. How to avoid sensitization of stainless steel? **[7]**

OR

Q8) a) What are the different types of cast iron? Draw white & gray cast iron microstructure and their compositions. State and justify the use of white and grey cast iron in the applications. **[8]**

b) Explain classification of Alloying Elements of Steel with respect to the relation with carbon and allotropic forms of iron. Give examples for each category. **[6]**

Q9) a) List any two types of brasses and bronzes (each) along with their composition and applications. Differentiate between brass and bronze. **[8]**

b) State the composition, properties and applications of **[6]**

i) Invar

ii) Inconel

iii) Duralumin

OR

Q10)a) Suggest suitable Non-Ferrous material for following applications. Justify? **[4]**

i) Space Craft

ii) Dental Implants

iii) Turbine Blades

iv) Electric Vehicles

b) What is Additive Manufacturing? Enlist any two Additive Manufacturing materials with its application? Explain required properties and importance of Additive Manufacturing material. **[6]**

c) What are general properties and applications of Nickel and its alloys? List all alloys of Nickel. **[4]**

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