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SEAT No. :

PE-5939

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**S.E. (Automobile & Mechanical Engineering/Mechanical Sandwich Engineering/ Automation & Robotics Engineering)  
ENGINEERING MATERIALS AND METALLURGY  
(2019 Pattern) (Semester - III) (202044)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Answer Q1 or Q2, Q3 or Q4, Q.5 or Q.6, Q.7 or Q.8*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be draw, wherever necessary.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.*

**Q1) a)** What is Equilibrium diagram? Explain its significance / importance. Draw equilibrium diagram for binary alloy. [8]

b) What is solid solution? Explain all the types in detail. [9]

OR

**Q2) a)** What do you mean by kinetics of phase transformation? Explain the term - 'Nucleation and Crystal growth' in detail. [8]

b) Draw iron and iron carbide equilibrium diagram and show the following points: critical temperatures, phases and reactions. [9]

**Q3) a)** Explain with neat sketch the austenite to bainite transformation. Compare lower bainite and upper bainite with respect to following points: temperature range, appearance, hardness and diagram. [9]

b) Explain the process of generation of isothermal transformation diagram? Draw TTT Diagram for Austenite to Martensite Transformation. [9]

OR

**Q4) a)** What is Annealing Process? State all types of Annealing Process? How does it carry out for Hypo and Hypereutectoid alloys? [9]

**P.T.O.**

- b) Define hardening process. Show following heat treatments on TTT diagram. [9]
- i) Conventional hardening.
  - ii) Interrupted quench hardening
  - iii) Martempering
  - iv) Ausforming

- Q5)** a) Define Steel. Classify the steel on the basis of : [8]
- i) Amount of carbon.
  - ii) Amount of alloying elements.
  - iii) De-oxidation.
- b) What are stainless steels? Explain its types in detail. [9]

OR

- Q6)** a) Differentiate between Steel & Cast iron. State & explain the types of cast iron. [8]
- b) Differentiate between White & Grey Cast Iron. [9]

- Q7)** a) Classify the Copper Alloys. State & explain in detail the types of  $\alpha$  brass. [9]
- b) What are the general properties and uses of Nickel. Enlist the Nickel Alloys. Write properties, composition and applications of any two Nickel Alloys. [9]

OR

- Q8)** a) Enlist the Bearing Materials. Write properties, composition and applications of any two Bearing Materials. [9]
- b) Explain in detail the process of Age Hardening. [9]

