VELAMMAL INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

ME 6403:ENGINEERING MATERIALS AND METALLURGY

FOCUSSED QUESTIONS

UNIT – I

 ALLOYS AND PHASE DIAGRAMS

 PART-A

1. When will interstitial solid solution occur?

2. What is isomorphous?

3. What is austenite and its crystal structure?

4. How is plain carbon steels classified?

5. Define an alloy?

 PART – B

1. Show the different steel and cast iron region in the iron carbon diagram with its microstructure and write down its composition, mechanical properties and application.

2. Draw a neat sketch and explain TTT diagram.

3. Draw Iron carbon diagram and label all fields?

4. With the help of neat sketch explain the two types of solid solution?

5. Draw a typical equilibrium diagram for an isomorphous system and explain the equilibrium cooling of any one alloy from the above diagram.

UNIT - II

HEAT TREATMENT

 PART – A

 1) Name various methods of heat treatment of steel.

2) When the annealing process is preferred?

3) Define full annealing.

4) What is the use of isothermal transformation diagram?

5) Define heat treatment.

 PART – B

1) Describe the method of plotting isothermal transformation or TTT diagram?

2) Draw an IT diagram or TTT diagram for an eutectoid steel .Indicate the various decomposition products on it and explain?

3) Draw a schematic CCT diagram for a carbon steel containing 0.8% C .Using this diagram explain how different cooling curves lead to the

(a) Annealing heat treatment

(b) Normalizing heat treatment

(c) Hardening heat treatment

4) Describe the full annealing heat treatment for plain carbon steel. What types of microstructure are produced by full annealing .Mention the applications and limitations of this process.

5) Recommend a heat treatment process to improve the machinability of high carbon steel. Explain the process and indicate the microstructure desired with a neat sketch.

UNIT –III

FERROUS AND NON FERROUS METALS

 PART –A

1. What is the effect of chromium alloying element on the properties of steel?

2. What is cast iron?

3. Compare spheroidal graphite cast iron and malleable cast iron.

4. What is HSLA?

5. What are the limitations of plain carbon steels?

 PART – B

1. Write short note on compositions and properties of the following stainless steels,

(a) Ferritic stainless steel

(b) Austenitic stainless steel

(c) Martensitic stainless steel

(d) Precipitation hardening stainless steel

2. Describe the types, compositions, properties and applications of cold work and hot work tool steels.

3. State the types, compositions and properties of high speed steel.

4. Discuss Hadfield and Mar aging steels on the following lines

(a) Chemical composition

(b) Heat treatment

(c) Mechanical properties

(d) Applications

5. Explain the various methods to achieve high strength in HSLA steels.

UNIT – IV

NON METALLIC MATERIALS

 PART – A

1. What is PTFE?

2. Define the term polymer?

 3. Describe the two means of polymerization?

4. What is PE?

5. What is PS?

 PART – B

1. Explain the properties and application of the PVC.

2. Explain the properties and application of the PE

3. Explain the properties and application of the PTFE

4. Explain the properties and application of the ABS.

5. Give the detailed account on:

(a) Urea formaldehydes

(b) Fibre reinforced plastics

(c) Cellulose nitrate.

UNIT – V

MECHANICAL PROPERTIES AND TESTING

 PART - A

1. Name the slip plane and slip direction for FCC crystal.

2. What is creep?

3. Define slip.

4. Name different types of facture.

5. Reason out why the tensile test is the most important mechanical test carried out in materials?

 PART – B

1. Sketch and describe the tests Rockwell hardness test.

2. Sketch and describe the tests Impact test.

3. Describe with neat sketch fatigue test.

4. Describe with neat sketch creep test.

5. Explain the mechanism of plastic deformation by slip and twinning with neat sketch.