STUDENT MAP

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VTU B.E/B.TECH QUESTION PAPER SET

CBCS
SEMESTER III

MATERIAL SCIENCE AND METALLURGY

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CBCS Scheme

USN ☐☐☐☐☐☐☐☐☐☐   **15AU32**

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Material Science and Metallurgy

Time: 3 hrs.   Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Write sketches wherever required.

Module-1

1	a.	Explain the FCC structure. Find the APF from the basics.	(06 Marks)
	b.	Differentiate between Edge and Screw dislocation.	(05 Marks)
	c.	With neat sketches, explain the mechanism of diffusion.	(05 Marks)

OR

2	a.	Sketch the stress – strain diagram for a ductile material indicating the salient points and explain i) Elasticity ii) Ductility.	(06 Marks)
	b.	Differentiate between slip and twinning.	(05 Marks)
	c.	Explain with sketches : i) Offset yield strength ii) Secent modulus.	(05 Marks)

Module-2

3	a.	Differentiate between Ductile and brittle fracture.	(05 Marks)
	b.	With neat sketches, explain the stages in the formation of cup and cone fracture.	(06 Marks)
	c.	With ϵ - t curve, explain the different stages of creep.	(05 Marks)

OR

4	a.	What is Stress relaxation? Derive an expression of stress relaxation.	(06 Marks)
	b.	Explain the mechanism of fatigue.	(05 Marks)
	c.	What is Endurance Limit? Explain how SN diagram is plotted for a material.	(05 Marks)

Module-3

5	a.	Explain Crystal growth and nucleation, with neat sketches.	(05 Marks)
	b.	Explain the various types of cast metal structures.	(06 Marks)
	c.	Explain the rules governing of formation of substitutional solid solution.	(05 Marks)

OR

6	a.	Explain Eutectic and Eutectoid reactions, with an example.	(06 Marks)
	b.	Sketch and explain the cooling curves of Solid solution, Pure Eutectic and Partially Eutectic and Partially solid solution.	(06 Marks)
	c.	Explain Gibb's phase and Lever rule.	(04 Marks)

Module-4

7	a.	Explain how TTT diagrams are constructed.	(06 Marks)
	b.	Differentiate between Annealing and Normalising.	(05 Marks)
	c.	Explain the Flame hardening process, with neat sketch.	(05 Marks)

OR

8 a. Explain the Composition, Properties and Microstructure of the following :
   i) Grey cast Iron   ii) S G Iron.   **(06 Marks)**
   b. Write a note on : i) Phosphor Bronze   ii) α Brasses.   **(06 Marks)**
   c. Enumerate the different uses of Aluminum and its alloys.   **(04 Marks)**

Module-5

9 a. What are Composites? Enumerate the complete classification of composites.   **(06 Marks)**
   b. Explain the Filament winding process, with neat sketch.   **(06 Marks)**
   c. Enumerate the advantages and applications of composites.   **(04 Marks)**

OR

10 a. Write a note on Smart materials.   **(05 Marks)**
   b. Write a note on Shape Memory alloys.   **(06 Marks)**
   c. Write the different non destructive testing methods and enumerate its applications. **(05 Marks)**

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CBCS Scheme

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Third Semester B.E. Degree Examination, June/July 2017
Material Science and Metallurgy

Time: 3 hrs.   Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1. a. Define Atomic packing factor. Find Atomic packing factor for F.C.C structure. (08 Marks)
    b. Clearly explain slip and twinning. (08 Marks)

OR

2. a. Clearly explain any three point defects. (07 Marks)
    b. Define True stress and Engineering stress. (02 Marks)
    c. Sketch stress strain diagram for a ductile material and show on the curve different salient points. (07 Marks)

Module-2

3. a. With the help of a graph, explain three stages of creep. (08 Marks)
    b. Write a note on stress relaxation. (04 Marks)
    c. Explain Fatigue testing in brief. (04 Marks)

OR

4. a. What is Fatigue? Why it is dangerous? (02 Marks)
    b. Explain different types of fatigue loading. (09 Marks)
    c. Explain Ductile fracture. (05 Marks)

Module-3

5. a. Explain Homogenous and Heterogeneous nucleation. (08 Marks)
    b. Explain Eutectic type phase diagram. (08 Marks)

OR

6. a. Explain Peritectic and Peritectoid transformations. (08 Marks)
    b. With the help of a cooling curve, explain the solidification of very very pure metal. (08 Marks)

Module-4

7. a. Explain the construction of TTT curves. (08 Marks)
    b. Explain Martempering and Austempering. (08 Marks)

OR

8. a. Explain Pack carburizing. (08 Marks)
    b. List the properties, composition and uses of Grey cast iron and SG iron. (06 Marks)
    c. List any four uses of Bronze. (02 Marks)

Module-5

9. a. List the functions of a matrix material in composites. (03 Marks)
    b. Write a note on non destructive testing and list its advantages and limitations. (08 Marks)
    c. Explain Hand lay – up process of production of FRP. (05 Marks)

OR

10. a. Write a note on Piezo Electric material and Fibre optic materials. (08 Marks)
    b. Write a note on Biological applications of Smart material. (04 Marks)
    c. List advantages and limitations of composite materials. (04 Marks)

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15AU32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Material Science and Metallurgy

Time: 3 hrs.   Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing*
ONE full question from each module.
2. *Missing data, if any, may be suitably assumed.*

Module-1

1   a.   Define co-ordination number and APF. Calculate APF for typical BCC structure.   **(07 Marks)**
    b.   Differentiate between edge dislocation and screw dislocation.   **(04 Marks)**
    c.   List and explain the factor affecting diffusion.   **(05 Marks)**

OR

2   a.   What do you mean by linear elastic properties? Explain briefly linear elastic properties.   **(05 Marks)**
    b.   Define critically resolved shear stress (CRSS)? Obtain an expression for CRSS, showing force diagram.   **(07 Marks)**
    c.   Differentiate between slip and twinning.   **(04 Marks)**

Module-2

3   a.   With the help of transition curve, explain ductile to brittle transition.   **(04 Marks)**
    b.   With the help of neat sketches, explain type II and type III fractures.   **(05 Marks)**
    c.   Draw typical creep curve. Explain its stages.   **(07 Marks)**

OR

4   a.   Define stress relaxation. Obtain an expression for stress relaxation.   **(08 Marks)**
    b.   With the help of SN diagram explain fatigue test to determine the fatigue strengths of a material.   **(08 Marks)**

Module-3

5   a.   With neat sketch explain the different cast metal structures.   **(04 Marks)**
    b.   Define solid solution. Explain different types of solid solutions.   **(07 Marks)**
    c.   Explain Hume – Rothary rules for the formation of substitutional solid solution.   **(05 Marks)**

OR

6   a.   State and explain Gibb's phase rule and lever rule.   **(04 Marks)**
    b.   Draw Iron – carbon diagram. Label its phase fields. Explain eutectic, eutectoid and peritectic reaction occur in $Fe - Fe_3C$ diagram.   **(12 Marks)**

Module-4

7 a. Draw a schematic TTT diagram for 0.8% C steel label all the regions and super impose the cooling curves which represents : i) Transformation of austenite is to coarse pearlite ii) CCR iii) Transformation of austenite into 100% Bainite. **(08 Marks)**

    b. With neat sketch, explain briefly pack carburizing heat treatment. List its merits and demerits. **(08 Marks)**

OR

8 a. Give composition, properties and uses of Grey cast iron and S.G iron. **(06 Marks)**

    b. Wire a note on AISI designation of steel. **(04 Marks)**

    c. Give the list of various aluminum alloys. Write a brief note on them. **(06 Marks)**

Module-5

9 a. Define composite. Explain Hand lay-up and filament winding processes employed for the production of FRP's. **(11 Marks)**

    b. List the advantages and applications of composites. **(05 Marks)**

OR

10   Write a note on :

    a. Shape memory alloys

    b. Biological applications of smart materials

    c. Selection of materials

    d. Use of NDT for materials. **(16 Marks)**

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CBCS Scheme

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Third Semester B.E. Degree Examination, June/July 2018

Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1. a. Define the following lattice:
   i) Unit cell
   ii) Space lattice
   iii) Atomic packing factor
   iv) Coordination number **(04 Marks)**
   b. State and explain Fick's first law of diffusion. **(04 Marks)**
   c. What do you mean by crystalline imperfection? Explain briefly point and scalar/line defects. **(08 Marks)**

OR

2. a. Explain in detail the mechanical properties in elastic and plastic region. **(08 Marks)**
   b. Discuss how the slip phenomenon differs in case of a polycrystal to the single crystal. **(08 Marks)**

Module-2

3. a. Define creep and discuss any two mechanisms for creep. **(08 Marks)**
   b. Discuss the basic modes of fracture with a neat sketch. List the difference between them. **(08 Marks)**

OR

4. a. What is fatigue? Draw the S-N curves for steel and aluminum. **(08 Marks)**
   b. Discuss the factors affecting the fatigue life of a component. **(08 Marks)**

Module-3

5. a. Explain the homogeneous nucleation. Discuss the significance of critical radius of nuclei. **(08 Marks)**
   b. Define solid solution, and explain the different types of solid solution. **(08 Marks)**

OR

6. a. State the Gibb's phase rule and explain with a simple example. **(08 Marks)**
   b. Draw the eutectic and eutectoid phase diagram. Give the invariant reactions. **(08 Marks)**

Module-4

7. a. Draw the iron-carbon equilibrium diagram and label all the fields. Write the different invariant reactions. **(08 Marks)**
   b. Explain the steps to construct TTT diagram. Draw a sketch of a TTT diagram, label all the fields for an eutectoid steel. **(08 Marks)**

OR

8 a. Differentiate between SG iron, grey iron and white iron with respect to microstructure, composition, properties and applications. **(08 Marks)**

   b. What are brasses and bronzes? Give an account of composition and application of α - brasses? **(08 Marks)**

Module-5

9 a. Explain the following for production of FRP:
   i) Spray layup process
   ii) Pultrusion process **(08 Marks)**

   b. Explain with a neat sketch production of MMC by using powder metallurgy process. **(08 Marks)**

OR

10 a. Define composite material and give the classification of composites. Enumerate important characteristics of composites. **(08 Marks)**

    b. Describe the features of Fibrous composites, laminated composites and particulate composites. **(08 Marks)**

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CBCS SCHEME

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Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define Space lattice. Find out basic atoms and packing factors or packing densities for B.C.C and F.C.C. Draw concerned diagram. **(08 Marks)**
    b. Differentiate between edge and screw dislocations with sketches. **(08 Marks)**

OR

2 a. With the help of a neat conventional stress – strain diagram, explain the behaviour of mild steel , under static uniaxial , tension till fracture. **(06 Marks)**
    b. Draw the stress – strain curve for the following materials : i) Copper ii) Cast iron. **(02 Marks)**
    c. Explain Slip and twinning with figures. **(06 Marks)**
    d. Define : i) Resilience ii) Ductility. **(02 Marks)**

Module-2

3 a. With the help of neat sketches, explain the different stages of ductile cup and cone fracture. **(08 Marks)**
    b. Define Creep. With a typical creep curve, explain the different stages of creep. **(08 Marks)**

OR

4 a. What is Fatigue? Draw and explain the SN curves for : **(08 Marks)**
      i) A material that displays a fatigue limit.
      ii) A material that does not display a fatigue limit.
    b. What are the various factors affecting fatigue strength? Explain. **(08 Marks)**

Module-3

5 a. Define Solid solutions and explain different types of solid solutions with figures. **(08 Marks)**
    b. Explain the homogeneous nucleation. Discuss the significance of critical radius of the nuclei. **(08 Marks)**

OR

6 a. Explain with examples : i) Gibbs phase rule   ii) Lever rule. **(12 Marks)**
    b. What are invariant reactions? With a neat sketches, explain
      i) Eutectic reaction   ii) Eutectoid reaction. **(04 Marks)**

Module-4

7 a. Explain the construction of TTT diagram, with figure and label it. **(08 Marks)**
    b. Write a short note on the following heat treatment processes :
      i) Annealing   ii) Carburizing. **(08 Marks)**

OR

| 8 | a. | Give the composition and uses of various cast – irons. | (08 Marks) |
| | b. | Write a note on Aluminum alloys. | (08 Marks) |

Module-5

9	a.	Define Composite materials. Explain the role of matrix material in a composite.	(04 Marks)
	b.	What are the advantages and limitations of composite materials?	(06 Marks)
	c.	With a neat sketch, explain any one method for production of fibre reinforced plastic.	
			(06 Marks)

OR

10	a.	What are shape memory alloys? With a neat sketch, explain the stress – strain characteristics of SMA's as a function of temperature.	(08 Marks)
	b.	What are the biological applications of smart materials used as implants?	(04 Marks)
	c.	Write a note on use of non – destructive testing.	(04 Marks)

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CBCS SCHEME

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Material Science and Metallurgy

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. Define atomic packing factor. Determine the APF for an FCC structure. **(08 Marks)**
   b. Differentiate between edge and screw dislocations. **(06 Marks)**
   c. State and explain Fick's laws of diffusion. **(06 Marks)**

OR

2. a. Draw the stress – strain diagram for a mild steel. Explain how the following properties are determined with the help of a stress-strain diagram.
   i) Ductility   ii) Yield strength   iii) Ultimate tensile strength **(08 Marks)**
   b. What are the linear elastic properties? Explain in brief. **(06 Marks)**
   c. Describe plastic deformation of single crystal by slip and twinning with neat sketches. **(06 Marks)**

Module-2

3. a. Explain various stages of ductile structure (cup and cone type) with suitable sketches. **(06 Marks)**
   b. Differentiate between ductile and brittle structures. **(06 Marks)**
   c. Describe various types of creep with the help of a typical creep curve. **(08 Marks)**

OR

4. a. What are the different types of fatigue stress cycles? Explain in brief. **(06 Marks)**
   b. Describe a rotating beam type fatigue test with a neat sketch. **(08 Marks)**
   c. Discuss the various factors affecting fatigue life. **(06 Marks)**

Module-3

5. a. Define Homogeneous and Heterogeneous nucleation. Explain in brief. **(08 Marks)**
   b. Explain different types of solid solutions with suitable sketches. **(06 Marks)**
   c. State and explain Hume Rothery's Rules for the formation of substitutional solid solutions. **(06 Marks)**

OR

6. a. State Gibb's phase rule. Define the terms phases component and degree of freedom. **(06 Marks)**
   b. Describe the construction of phase diagram by a thermal analysis method. **(08 Marks)**
   c. Draw a Peritectic phase diagram and write the Peritectic reaction. **(06 Marks)**

Module-4

7. a. Draw the T.TT diagram for a eutectoid steel and explain different microstructures. **(08 Marks)**
   b. Define hardenability. Explain Jominy End Quench Test of measuring hardnability. **(06 Marks)**
   c. Explain flame hardening and induction hardening process with suitable sketches. **(06 Marks)**

OR

8 a. What are the properties, composition and uses of Gray cast iron? (08 Marks)
   b. Explain different types of brasses in brief. (06 Marks)
   c. Describe the properties, composition and uses of Aluminum Silicon alloys. (06 Marks)

Module-5

9 a. Describe the role of matrix and reinforcement in composite materials. (06 Marks)
   b. Explain pultrusion process for the production of FRP's with a neat sketch. (08 Marks)
   c. What are the advantages of composite materials? (06 Marks)

OR

10 a. What are the optical properties of materials? Explain in brief. (08 Marks)
    b. Explain the biological applications of shape memory alloys. (06 Marks)
    c. Describe the various requirements for the selection of materials. (06 Marks)

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CBCS SCHEME

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17AU32

Third Semester B.E. Degree Examination, June/July 2019
Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define APF. Calculate the atomic packing factor of FCC crystal lattice. **(08 Marks)**
   b. Classify Crystal imperfection. Explain the point defects in details. **(07 Marks)**
   c. State and explain Flicks I law of diffusion. **(05 Marks)**

OR

2 a. Define Engineering stress and Engineering strain and obtain a relationship between True strain and Engineering strain. **(12 Marks)**
   b. Define i) Toughness ii) Resilience iii) Stiffness iv) Young's modules. **(08 Marks)**

Module-2

3 a. Explain Cup and Cone fracture, with neat sketch. **(08 Marks)**
   b. Define Creep, with a typical curve. Explain different stages of creep. **(08 Marks)**
   c. Write a note on ductile fracture. **(04 Marks)**

OR

4 a. Draw S – N diagram for mild – steel and aluminum. Explain RR Moore fatigue bending test, with neat sketch. **(12 Marks)**
   b. Explain types of Fatigue loading. **(08 Marks)**

Module-3

5 a. Explain Hume – Rothary rules for solid solution behaviour. **(08 Marks)**
   b. Explain the homogenous nucleation. Discuss the critical radius of the nuclai. **(12 Marks)**

OR

6 a. Construct a phase diagram for two metals completely soluble in liquid but partially soluble in solid state. **(10 Marks)**
   b. Draw diagram for Eutectic and Eutectoid reaction. Label the details. Explain. **(10 Marks)**

Module-4

7 a. What is TTT diagram? Explain with a neat diagram of martonsic transformation of austenite. **(08 Marks)**
   b. Explain Carbursing and flame hardening in brief. **(08 Marks)**
   c. Explain reasons for heat – treatment of metals. **(04 Marks)**

OR

8 a. What is meant by SG Iron? Explain the structure, composition , properties of SG Iron. **(12 Marks)**
   b. Write a note on Alluminium alloys. **(08 Marks)**

Module-5

9 a. With a neat sketch, explain any one method for production of FRP. **(12 Marks)**
   b. Discuss the advantages and application of MMC's. **(08 Marks)**

OR

10 a. Write a note on Smart Materials. **(06 Marks)**
    b. Write a note on Shape Memory alloys. **(06 Marks)**
    c. Write a different non- destructive testing methods and enumerate its applications. **(08 Marks)**

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18AU33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Calculate APF for BCE crystal structure. **(08 Marks)**
   b. Discuss briefly point and surface imperfections in crystals. **(07 Marks)**
   c. Explain briefly the various factors affecting diffusion in solids. **(05 Marks)**

OR

2 a. A 12.5mm Aluminium alloy test bar is subjected to a load of 2 tons. If the diameter of the bar is 12.4mm at this load. Calculate engineering strain, engineering stress, true stress and true strain. Assume no change in volume. **(12 Marks)**
   b. Explain briefly stiffness and modulus of resilience for a mild steel bar. **(08 Marks)**

Module-2

3 a. Explain Type I, Type II and Type III fractures in metals. **(12 Marks)**
   b. Define Creep. Explain three stages of creep process. **(08 Marks)**

OR

4 a. What is Creep strength and Creep rupture strength? **(04 Marks)**
   b. Define 'Fatigue'. Explain the various types of fatigue loading with examples. **(08 Marks)**
   c. With a diagram, explain fatigue testing. **(08 Marks)**

Module-3

5 a. Derive an expression for critical radius in homogeneous nucleation during solidification. **(08 Marks)**
   b. Discuss Hume-Rothary rules for the formation of substitutional solid solutions. **(08 Marks)**
   c. Explain briefly the types of solid solutions. **(04 Marks)**

OR

6 a. Sate Gibb's phase rule and discuss various terms involved in phase rule. **(05 Marks)**
   b. Two metals A and B have 100% mutual solubilities in the liquid and solid states. The melting point of pure metals A and B are 800°C and 600°C respectively. Details of start and end of solidification of various alloys in the series are as below:

Alloys of Composition	Temperature at the start of solidification	Temperature at the end of solidification °C
90% A + 10% B	798°C	750°C
70% A + 30% B	785°C	705°C
50% A + 50% B	757°C	675°C
30% A + 70% B	715°C	645°C
10% A + 90% B	650°C	615°C

   i)   Draw the phase diagram for A-B series.
   ii) Predict the number, type and relative amounts of phases present in an alloy of 40% A and 60% B at 700°C. **(15 Marks)**

1 of 2

Module-4

7 a. With the help of TTT and CCT curves, explain mar tempering process. **(10 Marks)**
   b. Explain Case Carburizing process. **(05 Marks)**
   c. Discuss flame hardening process for surface hardening. **(05 Marks)**

OR

8 a. Explain age-hardening for Al-Cu alloys. **(10 Marks)**
   b. Discuss properties, composition and uses of Grey Cast Iron and S.G. Cast Iron. **(10 Marks)**

Module-5

9 a. Discuss any two types of Cu-Zn alloys with respect to properties, composition and applications. **(06 Marks)**
   b. Discuss the properties, composition and applications of Al-Cu alloy and Al-Si alloy. **(06 Marks)**
   c. With a neat diagram, explain 'Hand-Lay up' process for producing FRP. **(08 Marks)**

OR

10 a. Give briefly the classification of composite materials. **(05 Marks)**
   b. With a neat diagram, explain 'Filament Winding' process for the production of FRP. **(10 Marks)**
   c. Discuss various applications of composites. **(05 Marks)**

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CBCS SCHEME

USN ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜ **18AU33**

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Materials Science and Metallurgy

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define Engineering stress and strain. Derive a relationship between True strain and engineering strain. **(10 Marks)**
   b. Name the type of the structure and sketch the unit cell of the following metals: Iron, Copper, Aluminum and magnesium. **(10 Marks)**

OR

2 a. What do you mean by linear and non-linear properties of materials? Explain in brief any two properties. **(08 Marks)**
   b. Write a note on crystal imperfections. Explain in detail about line defects. **(08 Marks)**
   c. Zinc has HCP structure. The height of the unit cell 0.494nm, the nearest neighbor is at a distance of 0.27nm. Calculate the volume of unit cell of zinc. **(04 Marks)**

Module-2

3 a. Distinguish between brittle and ductile fracture with graphical representation. **(08 Marks)**
   b. What do you understand by stress relaxation and elaborate with examples. **(06 Marks)**
   c. Draw and explain S-N curve for steel and Aluminium alloy. **(06 Marks)**

OR

4 a. Explain the creep behavior of mildsteel with the help of a three stage creep curve. **(10 Marks)**
   b. Discuss the effects of
      i) Surface Roughness
      ii) Stress Concentration on fatigue strength of metals. **(10 Marks)**

Module-3

5 a. Define Solid Solution with the aid of sketches, the various types of solid solution which may be formed in metallic alloys. **(08 Marks)**
   b. How do solid solutions differ from intermetallic compound? **(04 Marks)**
   c. Explain Hume-Rothary rules as applied to the formation of substitutional solid solutions. **(08 Marks)**

OR

6 a. Illustrate the effects alloying on the eutectoid temperature of steels. **(04 Marks)**
   b. Draw the iron-Carbon diagrams and labell all the parts. **(08 Marks)**
   c. What is invariant reactions? Write down the following invariant reactions
      i) Eutectic system
      ii) Peritectic system. **(08 Marks)**

Module-4

7 a. Explain the various Annealing process and their purpose. **(10 Marks)**
   b. Discuss nitriding as a method of surface hardening of steel and compare it with induction hardening. **(10 Marks)**

OR

8 a. Briefly describe effect of chemical composition and properties of
       i)   Malleable iron
       ii) Nodular iron.   (06 Marks)
   b. Explain case Carburization of surface heat treatment.   (06 Marks)
   c. Show schematically, the microstructure of the following, Gray cast iron and white cast iron
       and its properties, composition and applications.   (08 Marks)

Module-5

9 a. Write a short note on copper alloys.   (06 Marks)
   b. Explain the modification of Al-Si alloy.   (06 Marks)
   c. Discuss the composition, properties and types of α-Brasses and bronze. (08 Marks)

OR

10 a. What is Composite Materials? How it is classified?   (04 Marks)
   b. With a neat sketch, explain any one method of production of fiber reinforced plastic
       (polymer).   (08 Marks)
   c. Briefly discuss the advantages and applications of composites of materials. (08 Marks)

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