Code No: RR321802 **Set No.1**

III B.Tech. II Semester Regular Examinations, April/May -2005
MECHANICAL WORKING OF METALS
(Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An annealed metal contains a dislocation density of 10^6 and the dislocation density increases to 10^{12}on cold working. How this can be explained.
   (b) Diagramatically represent the intersection of two edge dislocations creating a jog and explain the phenomenon.
2. (a) What are the limitation of Brinnell's hardness test? Why should we adopt Rockwell hardness test? What necessiates employment of A, B & C scales in Rockwell test.
   (b) An engineer claims that metal 1 is harder then metal II when tested by Brinell test, But metal II is harder than metal 1 when tested by Rockwell test. Justify his claim and explain the reasons.
3. (a) Discuss the effect of transformation temperature on the tensile properties of steel.
   (b) Explain the limitations encountered in the compression test.
4. (a) Describe the various criteria of transition temperature obtained from charpy test.
   (b) Explain the notch sensitivity index
5. (a) Under what conditions a ductile material may fail in a brittle manner? Explain about Ductile-Brittle transition temperature.
   (b) What do you mean by fracture toughness? Explain.
6. (a) What is meant by fatigue failure? Where do normally come across such failure? Explain
   (b) Explain S-N curve of mild steel and a non ferrous alloy and compare their endurance limits.
7. (a) Explain the Naborro mechanism of creep.
   (b) Explain the role of super alloys and dispersion strengthed alloys for high temperature creep.
8. Explain the following N.D.T Processes.
   (a) Magnetic particle inspection
   (b) Ultrasonic flaw detection

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Code No: RR321802 **Set No.2**

III B.Tech. II Semester Regular Examinations, April/May -2005
MECHANICAL WORKING OF METALS
(Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how yield strength is related to grain size of ploy crystalline materials.
   (b) Explain how dislocation energy can be expressed in terms of Burger′s vector.
2. (a) Explain the working principle of shore scleroscope test.
   (b) Explain the basis for selection of loads in Briunell′s hardness test method.
3. (a) The tensile test is the most important test carried out on constructional steels. Give reasons and explain the test procedure and properties determined.
   (b) Explain the term 'off set yield strength'.
   (c) Explain why percent elongation in a tensile test depends on gauge length.
   (d) Define and explain modulus of toughness of a tensile test.
4. (a) What is transition temperature? Discuss the effect of various metallurgical factors affecting the transition temperature
   (b) Discuss the standard test for determining the transition temperature.
5. (a) Explain the Griffth′s theory of metals.
   (b) Distinguish between ductile and brittle fracture of metals. Draw stress-strain diagrams for both the types of failures with suitable examples.
6. (a) What is fatigue fracture? How the fractographic looks like? Explain it.
   (b) What factors affect the fatigue failure of metals?
7. (a) Explain how long time properties, of creep can be predicated by short time tests.
   (b) Explain Carson-Miller (L-M) parametric method.
8. Explain the following N.D.T Processes.
   (a) Magnetic particle inspection
   (b) Ultrasonic flaw detection

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Code No: RR321802 **Set No.3**

III B.Tech. II Semester Regular Examinations, April/May -2005
MECHANICAL WORKING OF METALS
(Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An annealed metal contains a dislocation density of 10^6 and the dislocation density increases to 10^{12} on cold working. How this can be explained.
   (b) Diagramatically represent the intersection of two edge dislocations creating a jog and explain the phenomenon.
2. (a) Describe the salienet features of Brinell; Rockwell B, vicker′s hardness tests.
   (b) In a vicker′s hardness test, a load of 30 kg f produces an impression whose longer diagnol measures 0.654 mm on the specimen. Calculate vickers hardness number.
3. (a) Why true stress is higher then nominal stress? Which stress should an engineer use when designing a bridge.
   (b) Distinguish between the term 'total elongation 'and' uniform elongation' in a tensile test.
4. (a) Explain why gray cast Iron is not notch sensitive.
   (b) Define notch impact strength. Quote the situations where to use charpy′s or Izod′s test. Compare them from different view points.
5. (a) A sample of glass has a crack of half length 2mm. The young′s modulus of glass 70GN/m^2 is and specific surface energy is 1J/m^2 . Estimate the fracture strength and compare it with its young?s Modulus.
   (b) Explain Ductile-Brittle transition temperature in metals.
6. (a) Describe in detail any one test for evaluating the fatigue strength and explain how the data is used to obtain fatigue limit.
   (b) Explain various mechanisms of fatigue failure.
7. (a) Explain why single crystal components are preferred to high temperature life.
   (b) What are the metallurgical variables, which control creep at elevelated temperature?
8. (a) Explain the principle of γ -Ray radiography.
   (b) What sources are used for this test?
   (c) Compare and contrast γ-Ray radiography with x-Ray radiography.

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Code No: RR321802 **Set No.4**

III B.Tech. II Semester Regular Examinations, April/May -2005
MECHANICAL WORKING OF METALS
(Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how yield strength is related to grain size of ploy crystalline materials.
   (b) Explain how dislocation energy can be expressed in terms of Burger′s vector.
2. (a) Explain the specific advantages of using vicker′ s hardness measurements for research work.
   (b) What do you mean by Rebound hardness test? Explain the working principle of Rebound hardness test. What are the advantages and limitations of this method over others.
3. (a) What do you mean by resilience? Derive an expression for resilience in terms of stress and elastic modulus.
   (b) Explain the terms in the following expression used under notch effect $\sigma_{\max} = K_t.\sigma_{av}$;
4. (a) What does impact test signify? Explain with necessary formulations, the procedure to be adopted in the impact test, conducted on a pendulum type impact testing machine.
   (b) Describe ductile to brittle transition temperature.
5. (a) A sample of glass has a crack of half length 2mm. The young′s modulus of glass 70GN/m^2 is and specific surface energy is 1J/m^2 . Estimate the fracture strength and compare it with its young?s Modulus.
   (b) Explain Ductile-Brittle transition temperature in metals.
6. (a) Describe cottrel mechanism of fatigue failure.
   (b) How can we enhance the fatigue life of a component?
7. (a) Draw an ideal Creep curve and explain the various stages on it.
   (b) With the sketch of a creep test set up explain how creep rupture tests are conducted.
8. (a) How Eddy current NDT works? Explain the working principle in detail.
   (b) In which type of components this test is used. What are its disadvantages?

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