VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA
DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING
SESSION 2015 - 16 (ODD SEMESTER)

Total Pages—4

(Set-Q_1)

B.Tech-5th (M & M)

Deformation Behaviour of Metals

Full Marks : 70

Time : 3 hours

Q.No.1 is compulsory and answer any **five** from the rest of the questions

The figures in the right-hand margin indicate marks

1. Answer the following (any *ten*) : 2 × 10

   (*a*) Write down the expression for von Mises yield criterion.

   (*b*) Define superplasticity.

   (*c*) What do you understand by grain boundary strengthening ?

   (*d*) What is Burgers vector in context of dislocations ?

   (*e*) What is the importance of equations of compatibility ?

(*Turn Over*)

(*f*) Give an example of isotropic and an anisotropic property.

(*g*) Why are kink bands formed ?

(*h*) Draw a stress-strain plot of a rigid ideal plastic material.

(*i*) Define Poisons ratio.

(*j*) Write down the expression for relation between engineering stress and true stress.

(*k*) Why is the compressive strength of a material higher than its tensile strength ?

(*l*) What is the slip system in FCC crystal ?

(*m*) Name a technique to observe dislocation in metals.

(*n*) What is strain energy in a material ?

2. (*a*) Explain how the origin of yield point phenomenan in a mild steel. 5

(*b*) Why Luder bands are not formed in aluminium or titanium alloys ? 5

3. (*a*) Derive the expression for Schmid's law. 5

(*b*) Explain Bauschinger effect with suitable diagram. 5

4. (*a*) How is deformation in polycrystalline metal different from a ceramic ? 5

(*b*) Explain the super lattice dislocation in intermetallics. 5

5. (*a*) What are twins and explain the types of twins observed in metals ? 5

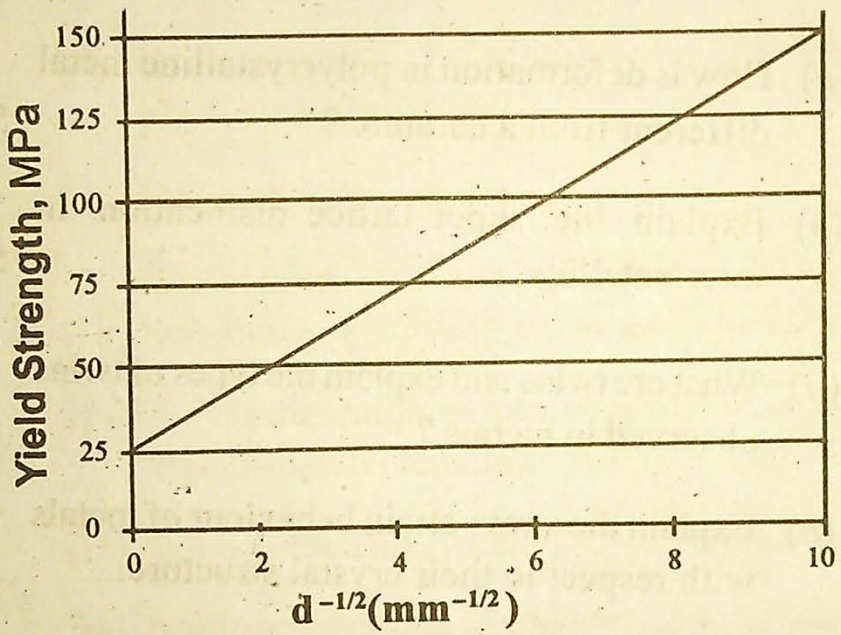
(*b*) Explain the stress-strain behaviour of metals with respect to their crystal structure. 5

6. (*a*) Explain Peierls stress and its implication. 5

(*b*) Explain isostress and isostrain analysis in materials. 5

7. (*a*) Name the strengthening mechanisms in metals and alloys. 5

(*b*) Using the diagram below, explain how can you develop a material having yield strength of at least 1 GPa ? 5



8. Write short notes on any *two* of the following : 5 + 5

(*i*) Frank-Read source

(*ii*) Solid solution strengthening

(*iii*) Strain rate sensitivity

(*iv*) Viscoelastic deformation.
