Registration No. :

Total number of printed pages – 2

Sixth Semester Regular Examination – 2015

MECHANICAL WORKING AND TESTING MATERIALS

BRANCH (S) : MM, MME

QUESTION CODE : J 214

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Write short notes on :   2 ×10

    (a) Explain why minor load is applied prior to the application of major load in Rockwell hardness testing method.

    (b) What is springback and its effect in bending ?

    (c) What is the difference between diffuse necking and localized necking ?

    (d) Define Pari's law.

    (e) What is the function of flash in close-die forging ?

    (f) Explain why Ugine-Sejournet process is used in hot extrusion.

    (g) State the difference between open and cold die forging.

    (h) How does strain hardening affect creep strength of a material ?

    (i) Explain why fatigue life of a material is highly sensitive to the surface smoothness.

    (j) What is the difference between bulk forming and sheet forming ?

2. State the forces which are acting during rolling and their geometrical relationships. Mention the variables which affect the rolling load.   10

Calculate the rolling load if steel is hot rolled 40% from a 30mm thick slab using a 900mm diameter roll. The slab is 750mm wide. Assume $\mu=0.30$. The plane strain flow stress is 130 MPa at entrance and 200MPa at the exit from the roll gap due to the increasing velocity.

3. Explain the Griffith theory of Brittle Fracture and give the stress required to propagate a crack in a brittle material as a function of the size of the micro-crack in plane stress and plane strain conditions.   10

4. (a) Explain briefly what is the effect of mean stress on fatigue.   5

   (b) Differentiate between low cycle fatigue and high cycle fatigue.   5

5. (a) Compare the advantages and disadvantages of the tension test, compression test and torsion test for determining the flow stress for the metal working processes.   5

   (b) Describe the relationship between hardness and flow curve.   5

6. (a) Why is it necessary to provide proper clearance between the punch and die in a shearing operation ? Give reasons.   5

   (b) Classify the metal extrusion process with respect to the direction, operating temperature and equipment.   5

7. (a) What is rubber hydroforming and how it is different from Verson-Wheelon process ?   5

   (b) Derive the expression for forging load in a plain strain condition.   5

8. Write short notes any **two** of the following :   5×2

   (a) Hydrostatic extrusion

   (b) Rockwell hardness

   (c) Liquid penetrant test

   (d) Stretch forming.