Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PCMT 4304

Sixth Semester Examination – 2013

MECHANICAL WORKING AND TESTING OF MATERIALS

BRANCH : MME / MM

QUESTION CODE : A 182

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. Answer the following questions : 2×10

   (a) Define and explain the role of flash gutter.

   (b) What is stress-corrosion cracking ?

   (c) Explain the reason for designing the complex clusters of rolls.

   (d) Draw and explain the distribution of roll pressure along the arc of contact.

   (e) In Rockwell hardness test, hardened steel is tested on _____ scale with the _____ indenter and a _____ kg major load.

   (f) State the equation of polar moment of inertia in terms of torsion moment and write its dimensions.

   (g) Explain the eddy current method of detecting defects.

   (h) Briefly explain the crack deformation modes.

   (i) Why is a notch in a thick plate far more damaging than in a thin plate ?

   (j) What are the three basic factors necessary to cause fatigue failure ?

P.T.O.

2. (a) Discuss the different types of forming processes. 5

(b) Describe the effect of temperature, strain rate, metallurgical structure, friction and lubrication on metal working processes. 5

3. (a) Discuss the significance of ductile to brittle transition temperature curve. 5

(b) Explain the metallurgical factors affecting the ductile to brittle transition temperature. 5

4. Explain the testing procedure and method to determine K_{IC}, the plain-strain fracture toughness. 10

5. (a) Explain with suitable diagrams the open die and closed die forging processes. 5

(b) Derive the expression for mean forging pressure of plate forged in plain strain with suitable diagram. 5

6. (a) Describe the usual procedure for determining an S-N curve and obtaining the fatigue limit of a material. 5

(b) Show and explain the dependence of limiting range of stress and alternating stress in fatigue on mean stress through Goodman diagrams. 5

7. (a) Using simplified theory of rolling express the geometrical relationships of roll diameter, coefficient of friction and sheet thickness for solid and cylindrical bars. 5

(b) Determine the maximum possible reduction for cold rolling a 300 mm-thick slab when $\mu=0.08$ and the roll diameter is 600 mm. What is the maximum reduction on the same mill for hot rolling when $\mu=0.5$? 5

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

(a) Ultrasonic testing for flaw detection

(b) Comparison between torsion test and tension test in terms of state of stress and strain

(c) Comparison between compression test and tension test.
