Total number of printed pages – 7   **B. Tech**

CPMT 6308

Sixth Semester Examination – 2008

**MECHANICAL WORKING AND
TESTING OF MATERIALS**

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 all the questions. State your answers
    True or False and justify it :   2 × 10

    (a) The residual stress patterns become
         reversed when the roll radius is changed.

    (b) As friction increases the neutral point
         moves towards the roll gap entry.

    (c) The ideal extrusion pressure p can
         be lower than the yield stress Y of the
         materials.

    (d) The maximum reduction per pass of in
         drawing is higher than the drawing of flat
         sheet.

    (e) Deep drawability of sheet metals increases
         in increasing the normal anisotropy of the
         metals.

    (f) Brinell hardness tester is recommended
         for very hard or very thin materials.

    (g) Brittle fracture occurs in ceramic materials
         is due to the presence of cracks.

    (h) Good impact strength indicates good wear
         resistance of the materials.

(i) The materials which exhibit non linear stress-strain curve have good fatigue registration.

(j) X-ray radiography used for testing the cracks of thin materials.

2. (a) Discuss the advantages and limitations of a cogging operation. 3

(b) Briefly explain the difference between open die forging, closed die forging and impression die forging. 3

(c) Write down the advantages and limitations of using small diameter rolls in flat rolling operation. 4

3. (a) The forging a flat disc under plain strain condition analyses to find an expression for the pressure at any radius, r is $p = Ye^{2\mu(R-r)/h}$. 6

(b) State and explain the methods that can be used to reduce the roll force. 4

4. (a) A 50-mm-thick plate is to be reduced to 40 mm in one pass in a rolling operation. Entrance speed = 17 m/min. Roll radius = 400 mm and rotational speed = 19.5 rev/min. Determine the minimum required coefficient of friction that would make this rolling operation possible, and forward slip. 4

(b) State your answer how would you control the center burst defect in extrusion. 3

(c) Define friction hill. Explain the effect of front and back tension on the friction hill of the rolling. 3

5. (a) A 100-mm-long cylindrical billet having 40 min in. diameter is reduced by indirect

extrusion to a 15-mm diameter. If die angle = 90° and the flow curve for the work metal has K = 750 MPa and n = 0. 15. Determine ram pressure and force.

4

(b) Explain what is the effect of friction on a forming limit diagram ? 3

(c) Write down number of the factors affect the extrusion pressure. 3

6. (a) Derive an expression the maximum reduction per pass in drawing should increase as strain hardening exponent 'n' increases.

4

(b) Explain the significations of impact test and discuss the factors of impact test affecting the properties of materials. 4

(c) Define bending allowance. Name factors that estimating the bending of materials.

2

7. (a) Derive an expression for the Brinell hardness number (BHN) is B.H.N =

$\dfrac{P}{\dfrac{\pi D}{2}\left[D - \sqrt{D^2 - d^2}\right]}$, where P is the load

applied load, D is diameter of steel ball and d is the diameter of the impression.

5

(b) Write down the number of defects of sheet metal working process and state briefly comments on reason of each defects.

5

8. (a) To bend a sheet-metal blank which posses modulus of elasticity $E = 30 \times 10^6$ lb/in^2, yield strength $Y = 40{,}000$ lb/in^2.

and tensile strength TS = 65,000 lb/in^2.

Determine the bending force if V-die will

be used with a die opening dimension

D = 1.0 in.   3

(b) Discuss the mechanisms of fatigue failure

and creep failure.   4

(c) Explain the effect of gain size on the

yield strength of materials.   3

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