[Total No. of Questions - 8] [Total No. of Printed Pages - 3]
(2125)

15378

M. Tech 1st Semester Examination

Metal Forming (NS)

PE-103

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any 5 (five) questions. Marks of questions are indicated against each question. Draw neat and comprehensive sketches wherever necessary to clearly illustrate your answer. Assume missing data suitably if any and specify the same.

1. (a) What is plasticity? Define and explain the stress-stain and yield criteria for cold and hot working of isotropic plastic material. Give stress-strain curves for both cold and hot working.

   (b) A copper strip of 100 mm long, 20 mm wide and 2 mm thick is elongated to 130 mm. If the ratio of true strain in width to true strain in length is 2, determine true strains in length, width and thickness directions.

   (c) State and explain the Tresca maximum sheer-strain energy criterion. How this criterion is important to analyze the plastic deformation in metal forming process? ((2+8)+3+7=20)

2. (a) How would you describe the strain hardening function for a plastic material? Explain.

[P.T.O.]

   (b) An aluminium plate of 4.5 mm thick and 1 m wide is deforming to 3.15 mm thick by applying pressure in a rolling mill during metal forming. How do you determine the heat generation during this metal forming? Explain all steps in detail. Assume other necessary data for this particular explanation.

   (c) Explain lateral extrusion process with a suitable sketch. Write the industrial application of extrusion process. (5+8+(5+2)=20)

3. (a) State and explain the various steps involved in prediction of working loads and maximum deformation analysis of the process of wire drawing.

   (b) Explain tube drawing process with neat sketch and write its industrial applications.

   (c) A copper bar of 100 mm in diameter and 200 mm long is extruded at 850ºC at a speed of 250 mm/s. Using square dies and assuming poor lubrication, estimate the force required in this operation if the final diameter after hot extrusion process is 82.5 mm. (8+(5+1)+6=20)

4. (a) Write the name of the different lubrication methods usually used in metal forming processes. Explain the principle and mechanism of any one lubrication method from your answer.

   (b) What are the lubricants usually used for the following cases (i) cold drawing, (ii) forging, (iii) extrusion of aluminium? Give appropriate answer with reason.

   (c) Write the name of the various defects occurred during metal forming by forging process. Explain the causes of defects during forging with simple sketches and their remedial actions. ((2+5)+6+(2+5)=20)

5. (a) State and explain the different steps involved in prediction of radial stress and punch load during deep drawing operation. Deduce an expression for radial stress in support of your answer. Assume suitable notation for this expression and specify the same.

   (b) Write the name of the various parameters affecting the deep drawing process. Explain in detail how these parameters are affected on deep drawing.

   (c) What is wrinkling? ((6+6)+(2+4)+2=20)

6. (a) Explain the affect of support rolls on rolling operation. List and explain the methods that can be used to reduce the roll force during flat strip rolling.

   (b) Deduce an expression for torque on the roll for flat strip rolling. Assume suitable notation for this expression and specify the same.

   (c) What are the roll separating forces? Explain in brief. ((4+5)+6+5=20)

7. (a) Stale and explain the procedure to predict the working load for plain strain forging of strip under condition of well lubrication and sticking of material with die.

   (b) Write the name of the various defects occurred during rolling. Explain in detail how these defects are eliminated or minimized during rolling. Give sketches for various defects in support of your answer. (10+10=20)

8. Write short notes on the following:

   (a) Various factors which affect rolling force.

   (b) Temperatures in quasi continuous forming operations.

   (c) Ironing in reference to the deep drawing.

   (d) Solid lubricants and their uses in metal forming processes. (5×4=20)