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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. – Mechanical Engineering

Semester End Examination; Dec - 2017/Jan - 2018

Manufacturing Process - III

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*

UNIT - I

1 a. Define metal forming. Enumerate the differences between hot working and cold working. 8

b. Explain the following concepts of metal forming : 8

i) Determination of flow stresses ii) Residual stresses in wrought products.

c. Derive the relationship between Conventional strain and True strain. 4

2 a. Give the differences between wrought products and cast products. 4

b. Explain the effect of following parameters : 12

i) Friction ii) Strain rate iii) Hydrostatic pressure.

c. Explain the concepts of plane stress and plane strain. 4

UNIT - II

3 a. Explain the concept of friction hill in forging and factors affecting on friction hill 6

b. With neat sketch, explain impression die forging and mention its applications. 6

c. A strip is given 20% reduction in thickness by rolling operation. If its final thickness is 5 mm and roll radius is 500 mm, determine the position of the neutral plane. Take $\mu = 0.2$ and assume the plane strain condition for rolling. 8

4 a. With neat sketches, explain cluster Rolling mill and Tandem mill. 8

b. Explain the defects in Rolling. 4

c. What load is required to forge a 300 mm large and 600 mm diameter cylindrical steel billet to 80% of its original between flat platens under the following conditions?

i) At a room temperature with good lubrication having $\mu = 0.05$ and yield stress 530 MPa. 8

ii) At 900° C where the yield stress is 60 MPa but there is sticking problem.

UNIT - III

5 a. Derive an expression for drawing load by slab analysis. 12

b. An Aluminum alloy is hot extruded at 400° C at 50 mm/sec from 150mm diameter to 50 m diameter. The flow stress at this temperature is given by $\bar{\sigma} = 200(\dot{\xi})^{0.15}$ MPa If the billet is 380 mm long and the extrusion is done through conical die with a semi cone angle of 60°. Determine the force required for the operation. 8

Contd…2

6 a. Explain the following Extrusion variables :
i)Alloy flow stress ii) Working temperature
iii) Extrusion ratio iv) Extrusion shape factor. 12

b. Calculate the drawing load required to obtain 30% reduction in area of a 10 mm diameter copper wire. The yield strength of copper in simple tension is 250 MPa. Die angle = 12° and coefficient of friction between working surfaces is 0.1. also calculate the power of electric motor if the drawing speed is 2 m/s. 8

UNIT - IV

7 a. With neat sketch, explain compound dies. 6

b. Explain LDR in drawing and parameters affecting on drawability. 6

c. It is required to punch a hole 10 mm diameter in a mild steel plate of 10 mm thick if the shear strength of the plate material is 600 N/mm^2 and compression strength of the punch materials is 200 N/mm^2. Determine whether the hole can be punched or not. If not suggest the alternative. 8

8 a. Explain the forming limit criterion. 6

b. Explain defects in deep drawing. 4

c. A 75 mm dia and 200 mm height cup is to be manufactured calculate the number of redraws assume 50%, 30% and 20% reduction for successive draws. Use conventional sheet metal. 10

UNIT - V

9 a. Define power metallurgy. Explain with neat sketches, steps involved in powder metallurgy. 8

b. Explain with neat sketches sintering mechanism. 6

c. Explain the processing of Rubber and ceramics. 6

10 a. Explain the following methods of power production :
i) Atomisation ii) Crusting and milling. 8

b. Explain the finishing operations of power metallurgy parts. 6

c. Explain the processing of Rubber and Elastomers. 6

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