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10ME55

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Manufacturing Process – III

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Differentiate clearly between wrought product and cast product. (05 Marks)
b. State the advantages and limitations of metal working processes. (05 Marks)
c. Show tri-axial stress system, with a neat figure and also represent the same in a matrix form. (05 Marks)
d. What is flow stress? Name the methods to determine the flow stress. (05 Marks)
- 2 a. Explain the effect of friction, lubrication and strain rate on metal working process. (06 Marks)
b. What is hydrostatic pressure? Explain the importance in achieving a successful forming operation without fracture. (06 Marks)
c. Discuss the concept of deformation zone geometry in metal working. (08 Marks)
- 3 a. Derive an expression for forging pressure and load in open die forging by slab analysis (considering sliding occurs at interface). Hence draw the friction hill. (10 Marks)
b. A rectangular bar of length 200 mm, width 100 mm and thickness 40 mm is compressed between two flat dies in plane strain condition such that the plane sections remain same and dimension 200 mm does not change. If the yield strength of the work material is 75 N/mm² and coefficient of friction $\mu = 0.08$, determine the minimum, average and maximum die pressure at the beginning of compression. (10 Marks)
- 4 a. Explain the following with neat figures:
i) Four high rolling mill
ii) Cluster rolling mill
iii) Tandem mill
iv) Planetary rolling mill (12 Marks)
b. Determine the maximum possible reduction for cold rolling of a 300 mm thick slab when $\mu = 0.08$ and roll diameter is 600 mm. What is the maximum reduction on the same mill for hot rolling when $\mu = 0.5$? (08 Marks)

PART – B

- 5 a. What is drawing process? Draw the cross section of a drawing die and explain the different elements of drawing die. (08 Marks)
b. What is redundant work in drawing? How it is estimated? (08 Marks)
c. A steel wire is drawn from an initial diameter of 6 mm to a final diameter of 5.2 mm. the angle die is 18°, the coefficient of friction at the die-wire interface is 0.15 and the yield strength of the material is 255 N/mm². Calculate the drawing stress in the absence of back tension. (04 Marks)

- 6 a. How seamless pipes and tubes can be produced by extrusion? Explain with a neat sketch. (08 Marks)
- b. Briefly explain four extrusion defects with their causes and remedies. (08 Marks)
- c. It is required to extrude a cylindrical aluminium billet of 50 mm diameter to 10 mm diameter. The length of the billet is 75 mm and the average tensile yield stress for aluminium material is 170 N/mm^2 . Calculate the force required for extrusion. Assume $\mu = 0.15$ and semi-die angle = 45° . (04 Marks)
- 7 a. Explain briefly the rubber forming process with respect to sheet metal forming. (05 Marks)
- b. Explain with neat sketch progressive die. (05 Marks)
- c. Explain the effect of anisotropy on limited draw ratio (LDR) in deep drawing. (05 Marks)
- d. A 25 mm square hole is to be cut in sheet metal of 0.75 mm thick. The shear strength of the material is $2.86 \times 10^5 \text{ kN/m}^2$. Calculate the cutting force. (05 Marks)
- 8 a. Discuss the principle and application of electro hydraulic forming. (08 Marks)
- b. What are the advantages and disadvantages of high energy rate forming (HERF)? (06 Marks)
- c. Discuss briefly the processing stages of powder metallurgy. (06 Marks)

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