USN | | | | | | | | | | |

10ME55

Fifth Semester B.E. Degree Examination, Jan./Feb.2021
Manufacturing Process – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat sketches, explain the classification of metal working processes on the basis of force applied. **(10 Marks)**

b. An aluminum alloy having σ_0 (uni-axial flow stress) as 500 MPa is subjected to three principal stresses σ_x as 200 MPa (tensile), $\sigma_y = 100$ MPa (tensile), $\sigma_z = 500$ MPa (compressive) and shear stress = 50 MPa will the material exhibit yielding? If not, what is the safety factor? **(04 Marks)**

c. Explain the different methods to determine the flow stress. **(06 Marks)**

2 a. Explain the effect of the following on metal working processes:
(i) Strain rate
(ii) Temperature. **(10 Marks)**

b. Explain with a neat sketch the hydrostatic pressure in metal working. **(05 Marks)**

c. Discuss the concept of deformation zone geometry in metal working. **(05 Marks)**

3 a. With the help of sketch explain the following forging operations:
(i) Upsetting
(ii) Drawing
(iii) Fullering. **(06 Marks)**

b. Derive an expression for slab analysis to determine the mean pressure for closed die forging. **(08 Marks)**

c. An aluminium billet 24mmϕ, 40 mm high is compressed between flat parallel dies to a height of 18 mm. The average yield stress is 6 N/mm^2. Find the frictionless workdone. Also determine the maximum pressure exerted if the coefficient of friction is 0.24. **(06 Marks)**

4 a. Describe the effect of front and back tension on the rolling loads. **(06 Marks)**

b. Explain the following rolling mills :
(i) Cluster mill (ii) Tandem mill. **(06 Marks)**

c. Calculate the rolling load if steel is hot rolled 30% from a 40 mm thick slab using a 900 mm diameter roll. The slab is 760 mm wide. Assume $\mu = 0.3$, the plan strain flow stress is 140 MPa at entrance and 200 MPa at the exit from the roll gap due to the increasing velocity. **(08 Marks)**

PART – B

5 a. Explain with sketch the wire drawing and rod drawing operations. **(06 Marks)**

b. Explain optimal cone angle and dead zone formation in drawing. **(06 Marks)**

c. Determine the drawing stress to produce a 20% reduction in a 10 mm stainless steel wire. The flow stress is given by $\sigma_0 = 1300\,\epsilon^{0.30}$ MPa. The die angle is 12° and $\mu = 0.09$. If the wire is moving through the die at 3 m/sec, determine the power required to produce the deformation. **(08 Marks)**