

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B-Tech ADE

Course Name : Metal forming Principle and Design

Course Code : ADEG 435

Nos. of page(s) : 2

Semester : VIII

Time : 03 hrs.

Max. Marks : 100

Instructions:

SECTION A (20 marks)

S. No.		Marks	CO
Q 1	A material is subjected to stresses in the ratio $\sigma_1, \sigma_2 = 0.3\sigma_1$, and $\sigma_3 = -0.5\sigma_1$. Find the ratio of σ_1/Y at yielding using the von Mises criterion.(Y=yield strength)	5	CO2
Q2	Describe about lubricants used in hot and cold forging.	5	CO1
Q3	Explain about the dies used for extrusion process.	5	CO1
Q4.	Define yield strength and explain how we can measure it.	5	CO2

SECTION B (40 Marks)

Q5.	Derive the expressions for coefficient of friction, angle of bite and maximum possible reduction by considering the limiting conditions in case of rolling. OR Neglecting the friction ,show that draw stress in a wire drawing operation is given by $\sigma_d = \bar{\sigma}_0 \ln[1/(1 - r)]$, where r is reduction in area and $\bar{\sigma}_0$ is the mean uniaxial flow stress of the material. Also, show that maximum possible reduction in area in this case is 63%.	10	CO4
Q6.	Prove that Yield stress in Plain strain condition is given by $\sigma'_0 = \frac{2}{\sqrt{3}} \sigma_0$.	10	CO2
Q7.	An annealed strip of 300mm width and 4 mm thickness is cold rolled to final thickness of 1.5mm using two successive stands with maximum possible draft in first pass. The rolls have identical diameter of 400mm .the roll speeds are 150rpm and 200rpm at the first and second stand respectively .The coefficient of friction between rolls and the work piece is 0.1. The uniaxial flow stress of the material is given by $\sigma_0 = 450\epsilon^{0.25}$ MPa. Calculate the power required for the second pass.	10	CO4
Q8.	Calculate ultimate tensile strength (UTS) for the given equation of power law	10	

$$\sigma = 1400\epsilon^{0.33} \text{ MPa}$$

SECTION-C (40 Marks)

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Q9.	<p>Explain about the following defects related to metal forming , also mention causes and remedies of given defects</p> <ol style="list-style-type: none"> a) Wavy edges b) Alligating c) Cold shut or fold d) Die Shift e) Hot tears/thermal cracking 	20	CO3
Q10.	<p>A block of Aluminum with dimensions 150 mm × 25 mm × 25 mm is pressed between flat dies at room temperature to a size of 150 mm × 100 mm × 6.25 mm. If the average uniaxial yield stress is 69 MPa, determine</p> <ol style="list-style-type: none"> a) the pressure distribution over the width at 10 mm intervals if $\mu = 0.1$ b) total forging load <p style="text-align: center;">OR</p> <p>1. An Al alloy billet is hot extruded at 400°C at 450 mm/s from 150 mm diameter to 50 mm diameter. The mean flow stress at this temperature is 250 MPa. If the length of the billet is 380 mm, the die angle is 60° and the coefficient of friction at die-billet interface is 0.1. Determine the force and power required if the extrusion is carried out by</p> <ol style="list-style-type: none"> (a) Direct process (b) Indirect process 	20	CO4