



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Metal forming principles and design
Program: B.Tech ADE
Course Code: (ADEG 435)
Instruction:

Semester: VII
Duration: 3 hours
Max. Marks: 100

SECTION A

Q-1	Define strain-hardening exponent. Enlist its significance in metal forming	4	CO1
Q-2	Describe the reasons for any two defects arises in extruded products.	4	CO1
Q-3	Compare powder metallurgy forging with conventional forging method	4	CO3
Q-4	Rolling of steel slab of 50mm thickness was performed using 1000 mm diameter rolls. The coefficient of friction between the slab and the roll is 0.2. find the maximum draft and bite angle.	4	CO2
Q-5	A 50 mm diameter hole has to be punched in the sheet having 2mm thickness and 100 MPa shear strength. Find the size of punch and die to perform this operation.	4	CO2

SECTION B

Q-6	Describe the effect of strain rate and temperature in metal forming process	10	CO1
Q-7	A circular bar of 30 mm diameter is extruded from the aluminum billet of the diameter 150 mm. shear strength of the material is 200 MPa. The ram velocity is 100 mm/sec. find the value of force and power requirement in this process. OR Analyze the open die forging of a rectangular slab between two flat dies to find the forging force. Consider both sliding and sticking friction condition.	10	CO2
Q-8	Compare various types of rolling mills.	10	CO3
Q-9	Explain any one high-energy rate forming process that can be used for making big radar dishes.	10	CO3

SECTION C

Q-10	Attempt either a and b both or the other part a) A cup of 10 cm height and 5 cm diameter is to be made from a sheet of two mm thickness. Find out the number draws required b) 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%. OR	10+10	CO2
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	A rectangular workpiece has a following original dimension that is $2a=100\text{mm}$, $h=30\text{mm}$ and width = 20 mm. the metal has a strength coefficient of 400 MPa and strain hardening exponent of 0.3. It is being forged in plain strain condition. Calculate the force required in 20% reduction.		
Q-11	Identify and explain the metal forming process/ group of processes that can be used for making below parts. a) Automotive roll cage b) Domestic utensils c) Automobile body mounting d) Wheel rims	20	CO3