Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: B-Tech PIE | **Semester** : VII
Course Name : Metal Forming-Principles & Design | **Time** : 03 hrs.
Course Code : ADEG435 | **Max. Marks:** 100
Nos. of page(s) : 2
Instructions:

SECTION A (20 Marks)

S. No.		Marks	CO
Q 1	Prove that mean flow stress is $\acute{\sigma} = \frac{K\varepsilon^n}{n+1}$	4	CO2
Q2	Explain the effect of semi die angle in extrusion process.	4	CO1
Q3.	Explain the concept of friction hill in cold forging.	4	CO1
Q4.	Define the following terms related to forging a. Barreling b. Fullering	4	CO1
Q5	Define the advantage and limitations of Indirect extrusion process.	4	CO1

SECTION B (40 MARKS)

Q6	Select & explain the suitable type of rolling mill ,temperature condition and relative value of friction coefficient for the following process a. Ingot reduced to slab – Ductility required in final product b. Rolling of thin sheet – Strength required in final product	10	CO1
Q7	In a metal forming operation ,determine that yielding will take place or not (according to von mises criterion) Given data - Yield stress of material =1250 MPa σ_{11}=1250 MPa σ_{22}= 450 MPa σ_{12}= 200 N/mm^2	10	CO2
Q8	Prove that Yield stress in Plain strain condition is given by $\sigma_0^{'} = \frac{2}{\sqrt{3}}\sigma_0$.	10	CO2
Q9	Differentiate between sticking and sliding conditions on the basis of a) maximum shear stress	10	CO1

	b) Force requirement c) Temperature conditions d) Maximum pressure e) Transition between sticking and sliding conditions OR Explain the causes and remedies of following defects produced in rolling a) Elastic flattening of roll b) Wavy edges c) Alligatoring d) Edge cracks	**10**	**CO3**
SECTION C (40 Marks)			
Q10	The strain hardening behavior of an aluminum alloy is given by $\sigma = 400\,\varepsilon^{0.22}\,MPa$. A right circular cylinder of this material 75 mm high and 25 mm diameter is to be upset to half of its height between flat dies at room temperature. Assume μ=0.4. a) Determine total forging load b) How much extra force is required over what would be needed if no friction were present? c) Calculate the ideal plastic work.	**20**	**CO4**
Q11	An aluminum alloy billet is hot extruded at 400°C at 450mm/sec from 150mm diameter to 50 mm diameter. The mean flow stress at this temperature is 250 MPa. If the length of the billet is 380 mm and die angle is 60° ,determine the force and power required if the extrusion is carried out by a) Direct process b) Indirect Process **OR** A 20 percent reduction in the area in a 10 mm diameter steel wire is achieved whose flow stress is given by $\sigma = 1300\,\varepsilon^{0.3}\,MPa$ The semi die angle is 12° and the coefficient of friction is 0.09. a. Calculate the drawing force b. Max possible reduction under these condition c. Power required if wire is moving through die at 3m/s.	**20** **20**	**CO4**