Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course: Strength of Materials **Semester: IV**
Program: B. Tech. FSE **Time 03 hrs.**
Course Code: GNEG 227 **Max. Marks: 100**

SECTION A

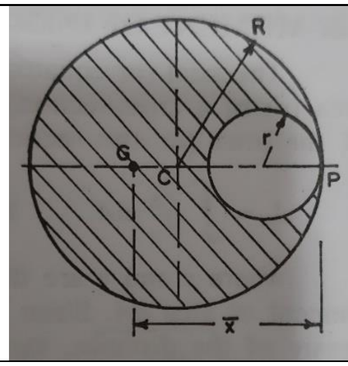
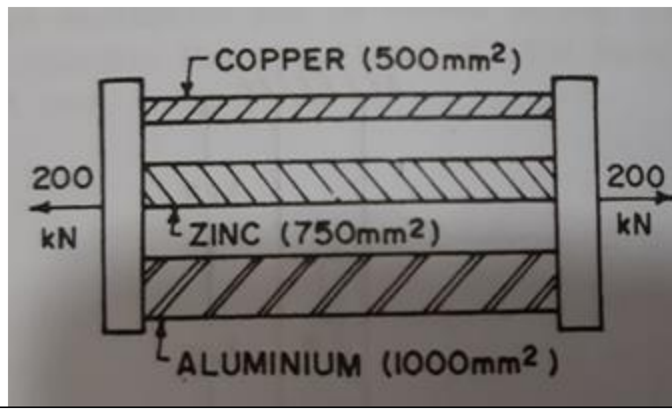
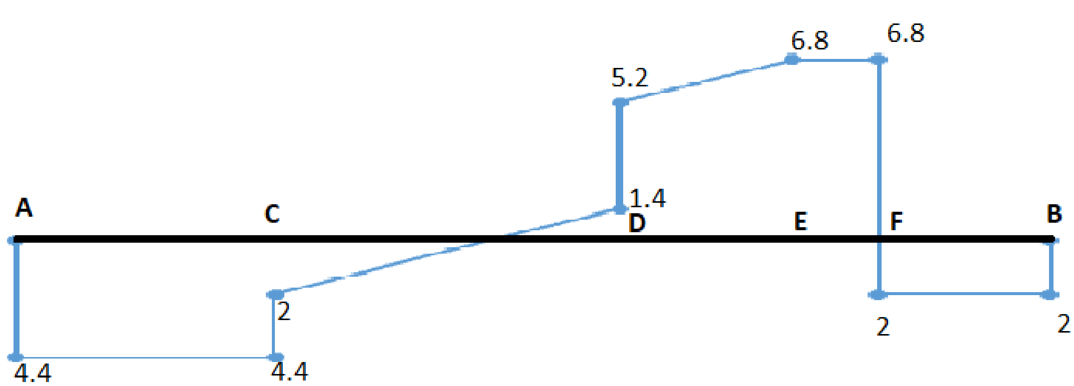
Each Question carries 5 Marks

S. No.	**Question**	**CO**
Q 1	**Define:** a. Elasticity b. Plasticity c. Hardness d. Yield stress e. Ultimate stress	**CO1**
Q2	Write short note on: a. Poisson's effect b. Modulus of Rigidity c. Stress Resilience	**CO1**
Q3	Explain gradual loading, sudden loading and impact loading.	**CO2**
Q4	Describe the concept of supports to define cantilever beam, simple supported beam and overhanging beam.	**CO2**
Q5	Brief the effect of thermal stress on composite bar (in words).	**CO2**
Q6	Explain the concept of flexural rigidity and how it is related with curvature of axis under bending (in words).	**CO1**

SECTION B

Each Question carries 10 Marks

Q 7	An element cube is subjected to tensile stresses of 110 N/mm^2 and 47 N/mm^2 acting on two mutually perpendicular planes. Each of the above stresses is accompanied by a shear stress of 63 N/mm^2, such that the one associated with the former tensile stress tends to rotate the element counterclockwise. Find the magnitude of the stresses on a plane inclined at 45° to the principle planes.	**CO4**
Q 8	A flat steel of thickness 12 mm tapers uniformly from 80 mm at one end and 40 mm at the other end in a length of 500 mm. If the bar is subjected to a load of 80,000 N, find its extension. Take E = 200000 N/mm^2. What is the percentage error if the average area is used for calculating the extension?	**CO3**
Q 9	A circular sheet of metal has radius R. if a hole of radius r is made as shown in figure, determine the position of centroid of the remaining part.	**CO4**

		
Q 10	Three bars, made of copper, zinc and aluminum are of equal length and have cross-section 0f 500, 750 and 1000 sq. mm respectively. They are rigidly connected at their ends, as shown in figure. If this compound member is subjected to a longitudinal pull of 200 kN, estimate the proportion of load carried by each rod and the induced stresses. Take E_c = 1.3*10^5 N/mm^2 , E_z = 1*10^5 N/mm^2, E_a = 0.8*10^5 N/mm^2 	**CO3**
Q 11	A 300*300 mm timber is strengthened by the addition of 300*6.25 mm steel plates secured to its top and bottom surfaces. The composite beam is simply supported at its end and carries an uniformly distributed load of 25 kN/m run over an effective span of 6 m. Find the maximum bending stress in the steel and timber at the mid-span. $E_{(steel)}$ = 2*10^5 N/mm^2 and $E_{(timber)}$ = 0.1*10^5 N/mm^2.	**CO3**
	Section C **Each Question carries 20 Marks.**	
Q12	The S. F. diagram for a beam AB, hinged at both the ends is shown in figure. Determine the loading on the beam and draw the B. M. diagram, indicating principal values. The spacing of AC, CD, DE, EF and FD are 3 m, 4 m, 2 m, 1 m and 2 m respectively. All the values of shear forces has been mentioned in the diagram and all are in kN. 	**CO5**