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

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

Course: Aircraft Structure-I **Semester: V**
Program: B. Tech ASE/ASE-AVE **Time 03 hrs.**
Course Code: ASEG 3010 **Max. Marks: 100**

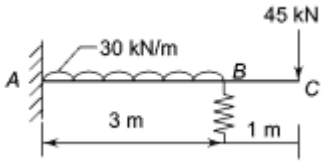
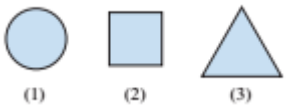
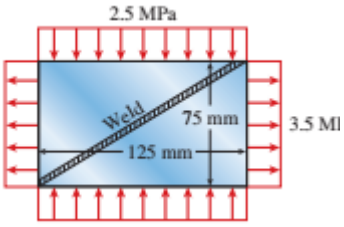
Instructions: a) All questions are compulsory.
b) Assume any suitable value for the missing data
c) Q1-Q3 are TRUE/FALSE

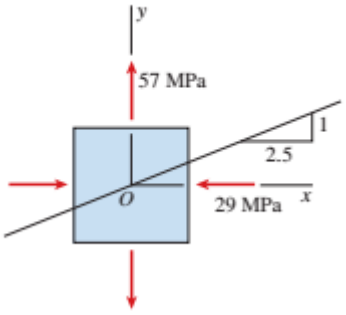
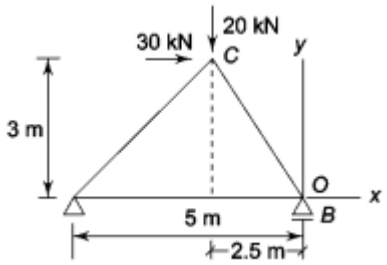
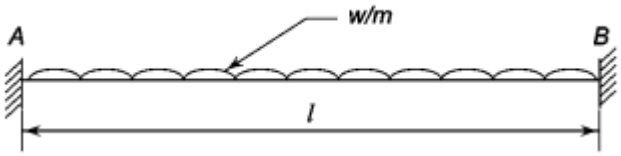
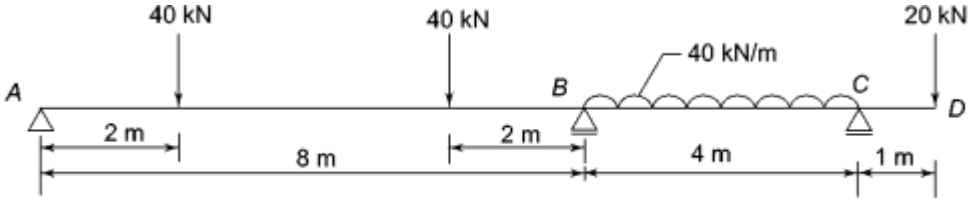
SECTION A

S. No.		Marks	CO
Q 1	a) For a 2D truss the possible number of static equilibrium equations are 3. b) If the applied bending moment on the beam is doubled then the strain energy stored in the beam is also doubled.	**4**	**CO1**
Q2.	a) Column buckles at the lower value of moment of inertia of the cross-section. b) Euler's buckling of column does not provide the value of deflection at any length of the column	**4**	**CO4**
Q3.	a) Strain energy method to determine deflection applicable only for linear elastic material b) A column is fixed from both ends, if the column is heated uniformly across length then the column can buckle due to increase in temperature	**4**	**CO3**
Q4.	a) Failure in ductile materials occurs due to shear b) No normal stress present on the plane of maximum shear stress.	**4**	**CO4**
Q5.	Define the following terms. a) Principal planes and principal stresses b) Mohr's Circle	**4**	**CO2**

SECTION B

Q 6	A cantilever beam is being propped at B. If the stiffness of spring is 3000 N/mm, then find the reaction at the spring. **EI** = 60,000 kNm^2	**10**	**CO2**

			
Q7.	Three pinned-end columns of the same material have the same length and the same cross-sectional area (see figure). The columns are free to buckle in any direction. The columns have cross sections as follows: (1) a circle, (2) a square, and (3) an equilateral triangle. Determine the ratios P1 : P2 : P3 of the critical loads for these columns. 	**10**	**CO3**
Q8.	The load on a bolt consists of an axial pull of I0 kN together with a transverse shear force of 6 kN. Calculate the diameter of the bolt according to (a) Maximum principal strain theory (b) Shear strain energy theory. Take factor of safety as 2, given yield strength of the material=310 N/mm2 and poisson's ratio = 0.27	**10**	**CO3**
Q9	A rectangular plate of dimensionsis formed by welding two triangular plates (see figure). The plate is subjected to a tensile stressof 3.5 MPa in the long direction and a compressive stress of 2.5 MPa in the short direction. Determine the normal stress (σ) acting perpendicular to the line of the weld and the shear stress (τ) w acting parallel to the weld. Also determine the plane of zero shear shear stress  **OR** An element in biaxial stress is subjected to stresses, as shown in the figure below. Using Mohr's circle, determine the following. (a) The stresses acting on an element oriented at a slope of 1 on 2.5 (b) The maximum shear stresses and associated normal stresses. Show all results on sketches of properly oriented elements.	**10**	**CO4**

			
SECTION-C			
Q10	Determine the vertical deflection of point C due to the applied load 	**20**	**CO2**
Q11.	Using moment area method draw the shear force and bending moemnt diagram of the beam. Determine the point of contraflexure.  **OR** Analyse the beam and draw the shear force and bending moment diagram. 	**20**	**CO1**