Name:

Enrolment No:

UPES

End Semester Examination, December 2023

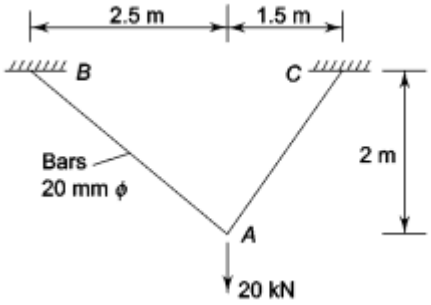
Course: Aircraft Structures-I **Semester: V**

Program: B. tech ASE **Time : 03 hrs.**

Course Code: ASEG 3018 **Max. Marks: 100**

Instructions: Assume any suitable value for the missing data.

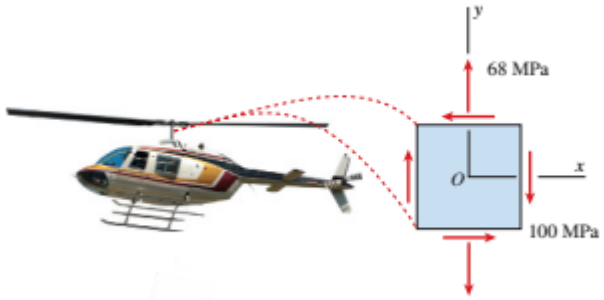
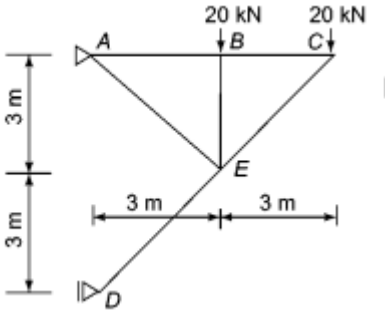
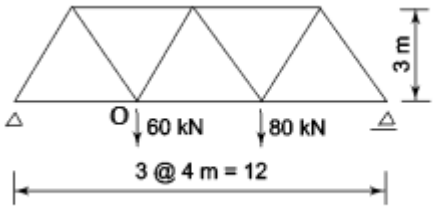
SECTION A
(5Qx4M= 20 Marks)

S. No.		Marks	CO
Q1	State True/False for below questions a) Buckling can occur in both compression and tension members. b) Max. Shear stress theory applicable for ductile and brittle materials c) Plane of maximum shear stress has always zero normal stress d) Stiffness is both material and geometric properties	**4**	**CO1**
Q2	The sections of two columns with same length, one square and the other solid circular, have equal area. Which column will be more flexible and why?	**4**	**CO2**
Q3	For axial members shown below, calculate the vertical deflection of point A 	**4**	**CO1**
Q4	State Von. Mises failure theory and draw the failure envelope.	**4**	**CO2**
Q5	Briefly explain the effective length of the column and its significance	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A 40-mm by 80-mm timber, 2.2 m long, is used as a column with built-in ends. If E = 10 GPa and yield strength of 30 MPa, determine the largest axial load that can be carried with a factor of safety of 2.	**10**	**CO4**
Q 7	A cantilever beam of length 4 meters is propped at its free end and subjected to a point load of 8000 N applied at a distance of 2 meters from the free end. The beam has a uniform cross-sectional area of 500 mm^2 and a modulus of elasticity (E) of 200 GPa. Calculate the maximum bending moment at the	**10**	**CO3**

	propped end and the reaction force at the support. Also draw the shear force and bending moment diagram.		
Q8	An engineer want to design a solid steel shaft 100 mm in diameter and 8 m long subjected simultaneously to an axial compressive force P and the torque T =35 kN m. Determine maximum safe value of P according to the maximum shear stress theory that can be applied. Use σ_y = 200 MPa	**10**	**CO3**
Q9	Consider a hollow cylinder shell of outer radius r_o = 140 mm , and inner radius r_0 = 125 mm. It is subjected to axial compressive force of 68 KN and torque of 35 KNm. Determine the principal and peak shear stress in the shell. 	**10**	**CO4**
SECTION-C **(2Qx20M=40 Marks)**			

Q10	The rotor shaft of a helicopter drives the rotor blades that provide the lifting force and is subjected to a combination of torsion and axial loading. If the normal stress σ_y = 68 MPa and shear stress = -100 MPa . Using Mohr's circle, determine the following. (a) The stresses acting on an element oriented at a counterclockwise angle 25^0 from the x axis. (b) Find the maximum tensile stress, maximum compressive stress, and maximum shear stress in the shaft. Show all results on sketches of properly oriented elements. (c) Determine the Von-Mises stress acting on the rotor shaft. 	**20**	**CO4**
Q11	For the truss member shown below, determine the horizontal and vertical deflection of the point C and find the resultant displacement.  **OR** For the truss member shown below, determine the horizontal and vertical deflection of the point O and find the resultant displacement 	**20**	**CO2**