Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2020

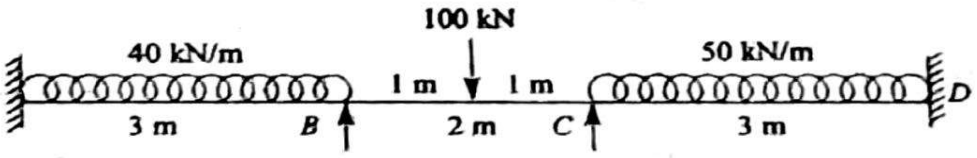
Course: Aircraft Structure-I **Semester: V**
Program: B.Tech ASE , ASE+AVE **Time 03 hrs.**
Course Code: ASEG 3010 **Max. Marks: 100**

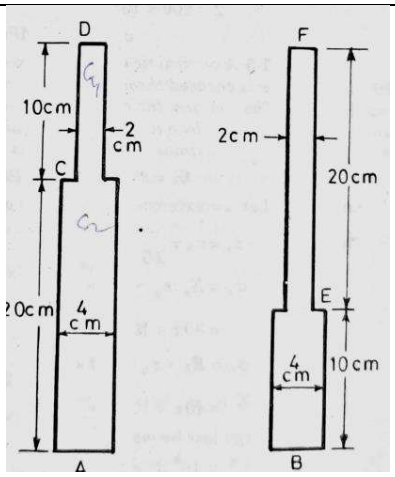
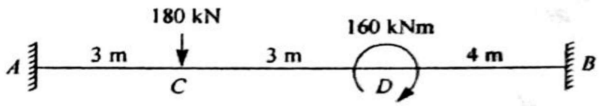
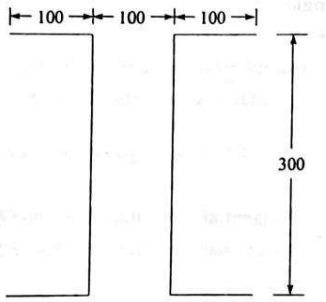
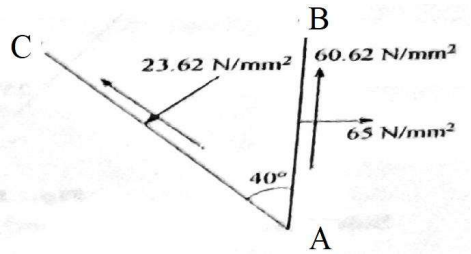
Note: Section A and B is compulsory. Attempt any **ONE** Questions from Section-B. Assume any **MISSING** data accordingly. Brief and to the point answers are expected.

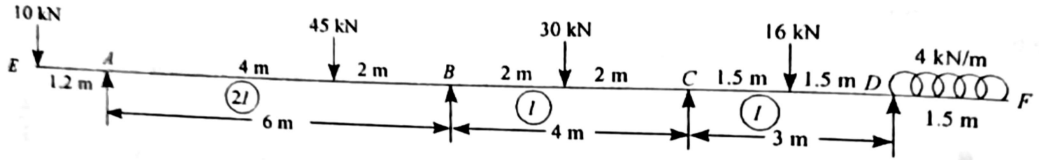
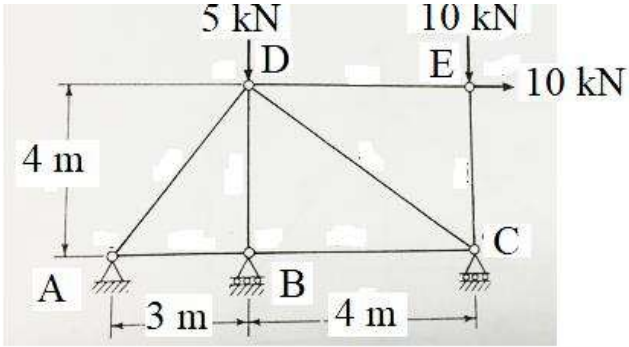
SECTION A (30 Marks)

S. No.		Marks	CO
Q 1	1A. In a Uniaxial state of stress, the normal to the plane across which the normal stress is maximum, makes an angle with the direction of loading, which is equal to [1 M] A. 90° B. 180° C. 0° D. 45° 1B. Principal planes are the planes on which maximum stress is the [1 M] A. shear stress B. normal stress C. tangential stress D. temperature stress. 1C. the radius of Mohr's circle gives the values of [1 M] A. maximum Normal stress B. minimum normal stress C. maximum shear stress D. minimum shear stress. 1D. A iron block of 5cm^2 cross section carries an axial compressive load of 50 kN. The magnitude of the normal stress on a plane whose normal is inclined at 30° to the axis of the block is: [2 M] A. 50 N/mm^2 (tensile) B. 50 N/mm^2 (compressive) C. 75 N/mm^2 (tensile) D. 75 N/mm^2 (Compressive)	**5**	**CO 4**

Q 2	2A: A strut may be defined as a member of structure: [1M] A. Carrying a compressive load B. In any position carrying a compressive load C. Carrying a tensile load D. In any position carrying a tensile load. 2B: Euler's buckling formula is valid for: [1 M] A. Short columns B. Medium columns C. Long columns D. All of the above. 2C: Rankine formula for the columns takes into account [1 M] A. The eccentricity of the loading B. The initial curvature of the column C. The effect of direct compressive stress D. The effect of slenderness ratio 2D: A beam column may be defined as a column [1 M] A. Carrying compressive load B. Carrying eccentric load C. Carrying axial load D. Carrying axial and transverse load. 2E: A column shall always buckle about an axis about which: [1 M] A. The moment of inertia is maximum. B. The moment of inertia is minimum. C. Radius of gyration is minimum. D. Radius of gyration is maximum	**5**	**CO2**
Q 3	3A: A circular bar is subjected to an axial force and shear force, the difference between two principle stresses is 120 Mpa. Based on maximum shear stress theory what is the factor of safety, if elastic limit of the bar is 300 Mpa? [2 M] A. 5 B. 2 C. 2.5 D. 3 3B: According to maximum strain energy theory, failure of material due to complex stresses occurs when total stored energy per unit volume at a point _____. [1 M] A. reaches the value of yield point B. reaches the value of strain energy stored per unit volume at yield point C. reaches the value of strain energy stored per unit volume at elastic limit D. exceeds total strain energy caused by uniaxial stress at elastic point	**5**	**CO3**

	3C: For designing ductile materials, which of the following theories is/are used? [1 M] A. Maximum shear stress theory B. Shear strain energy theory C. Both a. and b. D. None of the above 3D: St. Venant's theory is also known as maximum _____. [1 M] A. principle stress theory B. shear stress theory C. principle strain theory D. strain energy theory		
Q 4	Establish reason for the correctness of the following statements. A. The Rankine's formula is valid for all types of Columns. [3 marks] B. Landing gear is the good example of Beam - Column. [2 Marks]	**5**	**CO2**
Q 5	Explain the following terms: A. Principal planes. B. Mohr' circle. C. Factor of safety.	**5**	**CO4**
Q 6	Write the distribution factor for the beam as shown below.  	**5**	**CO1**
SECTION B (5 x 10 = 50 Marks)			
Q 7	Two similar round bars A and B are each 30 cm long as shown below. The bar A receives an axial blow which produces a maximum stress of 200 MPa. Find the maximum stress produced in the bar B by the same blow.	**10**	**CO4**

			
Q 8	Find the fixing moments and the reaction force at the supports and draw the bending moment diagram for the fixed beam as shown below. Take E = 200 kN/mm^2 and I = 2.75 x 10^7 mm^4. 	**10**	**CO1**
Q 9	A steel column of 8.5 m effective length consists of two channels placed back to back at a spacing of 200 mm as shown below. Find the critical load for the column by Euler theory. Take E = 2x10^5 N/mm^2 and thickness of all the members is 2mm. 	**10**	**CO2**
Q 10	Figure shows the normal and tangential stresses on two planes. Determine the principal stresses and the principal planes. Also verify the results using Mohr's circle. 	**10**	**CO4**

Q 11	A machine element is subjected to the following stresses σx = 60 MPa, σy = 45 MPa and τxy = 30 MPa. Find the factor of safety if it is made of C$% steel having yield stress as 353 MPa, using the following theories of failure. I. Maximum principal stress theory. II. Maximum shear stress theory.	**10**	**CO3**
	Section – C (20 Marks)		
Q12	Find the moments and the reactions at supports for the continuous beam as shown below. Also draw the bending moment diagrams for the beam.  **OR** Analyze the statically indeterminate truss as shown below, determine the member forces, and support reactions. Take E = 200 GPa and A = 1000 mm^2 is same for all the members.  	**20**	**CO1**