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7/6/2022 evening

University of Mumbai
Examination: First Half 2022 (May-June 2022)
Program: Civil Engineering
Curriculum Scheme: R2019 (C Scheme)
Examination: SE Semester: III

Course Code: CEC302 Course Name: Mechanics of Solids
Time: 2 Hour 30 Minutes Max. Marks: 80

Q1.	Choose the correct option for the following questions. All the Questions are compulsory and carry 2 marks each.
1.	A thin cylinder of inner radius 0.5 m and thickness 15 mm is subjected to an internal pressure of 1.5 MPa. The average circumferential (hoop) stress in MPa is
Option A:	25
Option B:	50
Option C:	100
Option D:	200
2.	Shear Force and Bending moment at B is _____ & _____.
Option A:	31.25 kN & 67.71 kN.m (Hogging)
Option B:	31.25 kN & 67.71 kN.m (Sagging)
Option C:	21.25 kN & 67.71 kN.m (Hogging)
Option D:	21.25 kN & 67.71 kN.m (Sagging)
3.	Elongation of steel rod is ..... if length and c/s of rod is 900 mm and 600 mm^2 respectively, subjected to an axial pull of 40 kN. Take E= 200 GPa.
Option A:	0.1 mm
Option B:	0.2 mm
Option C:	0.3 mm
Option D:	0.4 mm
4.	Moment of Inertia about the bottom of a triangle with base B and height H is_____
Option A:	$BH^3/36$
Option B:	$BH^3/12$
Option C:	$BH^3/48$
Option D:	$BH^3/24$
5.	Maximum shear stress developed on the surface of a solid circular shaft under pure torsion is 240 MPa. If the shaft diameter is doubled then the maximum shear stress developed corresponding to the same torque will be
Option A:	120 MPa
Option B:	60 MPa
Option C:	30 MPa
Option D:	15 MPa
6.	For a circular shaft of diameter d subjected to torque T, the maximum value of the shear stress is
Option A:	$(64T) / (\pi d^3)$
Option B:	$(32T) / (\pi d^3)$
Option C:	$(16T) / (\pi d^3)$

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7.	A simply supported beam of span (L) m is subjected to a point load (W) kN at the center. Maximum deflection in beam is _____ m.
Option A:	$\frac{5WL^4}{384\,EI}$
Option B:	$\frac{WL^3}{48\,EI}$
Option C:	$\frac{5WL^4}{348\,EI}$
Option D:	$\frac{WL^3}{84\,EI}$
8.	A simply supported beam of span length 6 m and 75 mm diameter carries a uniformly distributed load of 2 kN/m. The maximum bending stress is
Option A:	72.43 MPa
Option B:	217.30 MPa
Option C:	325.15 MPa
Option D:	651.90 MPa
9.	A rectangular beam 100 mm wide and 250 mm deep is subjected to a shear force of 50 kN. What will be the maximum shear stress at the neutral axis?
Option A:	1.5 MPa
Option B:	3 MPa
Option C:	4.5 MPa
Option D:	6 MPa
10.	A solid round bar of 3 m long and of 50 mm diameter is used as a column with both ends hinged. Crippling load by Eulers is _____, If $E = 2 \times 10^5$ MPa
Option A:	67.29 kN
Option B:	57.29 kN
Option C:	62.29 kN
Option D:	70.29 kN

Q2.	**Solve any 4 out of 6** **5 marks each**
A	With usual notations, establish the relation between E, G, K and μ.
B	A thin cylindrical shell 3.2 m long is having 1.2 m internal diameter and it is 15 mm thick. Calculate hoop stress, longitudinal stress and maximum shear stress if internal fluid pressure is 1.6 MPa.
C	Draw SFD and BMD for a simply supported beam AB of span "L" m carrying a triangular load of zero intensity at the support A and (W) kN/m at the support B.
D	Define core or kernel of the section. Locate core of the solid rectangular section having width of 300 mm and depth of 400 mm.
E	A steel rod of 16 mm diameter and 5 m long is connected to two grips, one at each end at a temperature of 120^0 C. Find the pull exerted when the temperature falls to 40^0 C. i. If the ends do not yield. ii. If the ends yield by 1 mm Take $E = 2 \times 10^5$ N/mm^2 and $\alpha = 12 \times 10^{-6}$ / ^{0} C.
F	An unknown weight falls through 15 mm on a collar rigidly attached to the lower end of the bar 4 m long and 800 mm^2 in area. If the maximum instantaneous elongation is 3 mm, find the corresponding stress and the value of unknown weight. Take $E = 2 \times 10^5$ N/mm^2

Q3	**Solve any 2 Questions out of 3** **10 marks each**
A	In an experiment, a bar of 40 mm diameter and 200 mm in length is subjected to a pull of 70 kN. Change in length and diameter is 0.09 mm and 0.0039 mm respectively. Calculate the Poisson's

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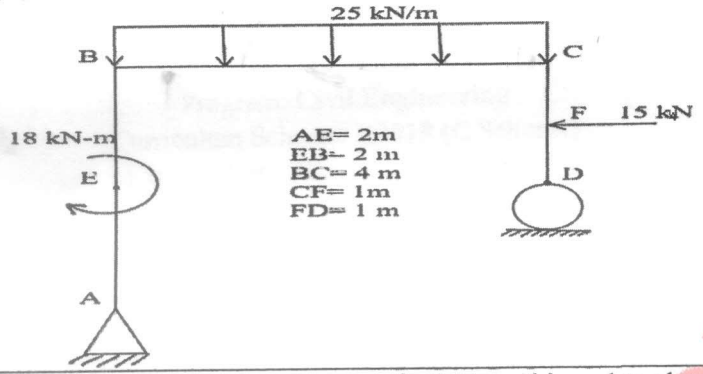
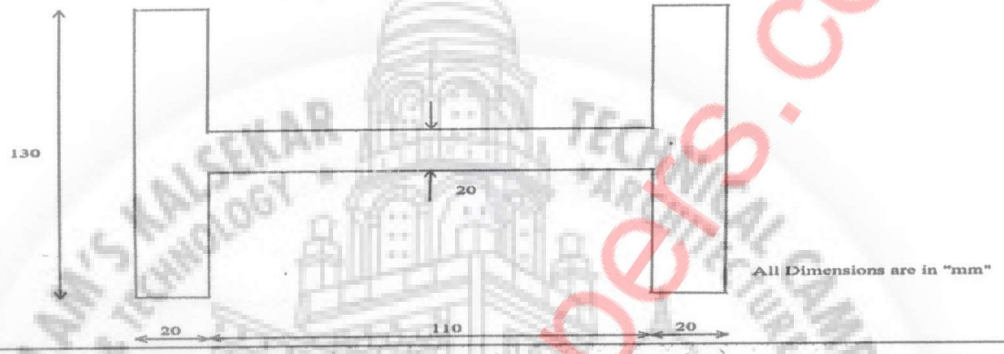
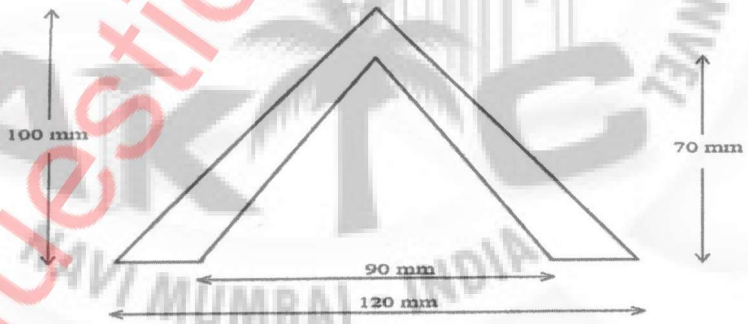
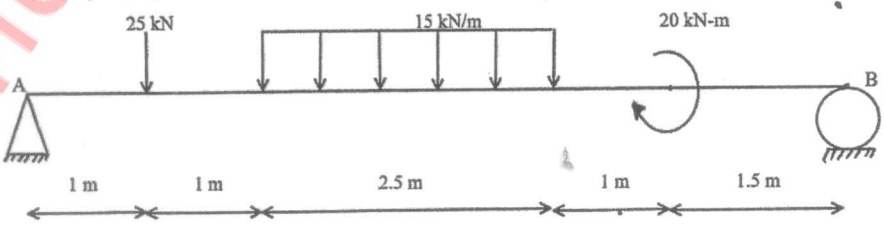
B	Draw AFD, SFD and BMD for the frame shown below. 
C	Figure shows symmetrical inverted I cross section of a beam subjected to shear force of 150 kN. Draw shear stress distribution diagram across the c/s. 

Q4	Solve any 2 Questions out of 3	10 marks each
A	A hollow circular steel shaft of 6 m length has to transmit 180 kW power at 150 rpm. If internal diameter is 0.6 times external diameter, total angle of twist is not to exceed 4^0 and shear stress is limited to 50 N/mm^2, determine diameter of the shaft. Take G = 84 kN/mm^2.	
B	A beam of 6 m span is loaded with a UDL of 15 kN/m. The given fig. is symmetrical about Y-Y axis. Determine and draw the maximum tensile and compressive bending stresses across the section. 	
C	For the S/S beam shown, calculate slope at supports and maximum deflection by using Macaulay's method. Take EI constant. 	

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