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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

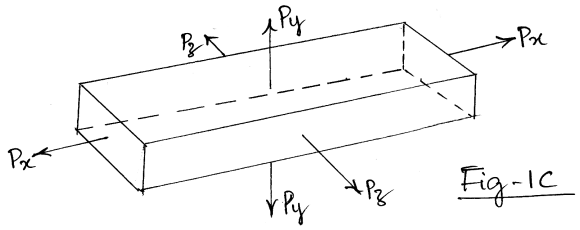
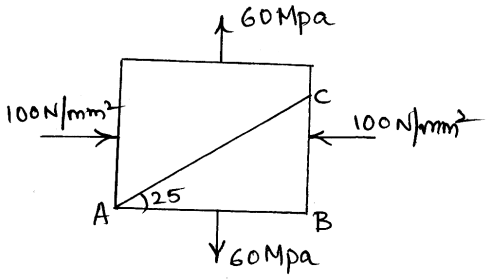
Third Semester, B.E. - Civil Engineering

Semester End Examination; Dec. - 2019

Strength of Materials

Time: 3 hrs *Max. Marks: 100*

Note: i) PART - A is compulsory. **Two** marks for each question.
ii) PART - B: Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks
	I : PART - A	**10**
I a.	Define factor of safety and Poisson's ratio.	2
b.	Differentiate between hoop stress and longitudinal stress.	2
c.	Define shear force and bending moment.	2
d.	Define section modulus and give the expression.	2
e.	Define effective length and slenderness ratio.	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	Derive the expression for the deformation for a bar of uniformly tapering section subjected to an axial force.	6
b.	A bar of length 1000 mm and diameter 30 mm is centrally bored for 400 mm, the bore diameter being 10 mm under a load of 30 kN. If the extension of the bar is 0.222 mm, what is the modulus of elasticity of the bar?	12
c.	A bar of rectangular section shown in Fig.1(c) is subjected to stresses P_x, P_y and P_z in x, y and z directions. Show that if sum of these stresses is zero, there is no change in volume of the bar.  Fig-1C	12
	UNIT - II	**18**
2 a.	Derive the expressions for circumferential and longitudinal stresses in case of thin cylinders.	6
b.	The direct stresses at a point in a strained material are 100 N/mm^2 compressive and 60 MPa tensile as shown in Fig. 2(a). Find the stresses on the plane AC. 	12
c.	A pipe of 250 mm internal dia and 100 mm thickness contains a fluid at a pressure of 7 N/mm^2. Determine the maximum and minimum hoop stress across the cylinder and also the longitudinal stress.	12

Contd…2

UNIT - III **18**

3 a. A cantilever beam of span 'L' subjected to UDL of W/unit length over the entire span. Sketch BMD and SFD. 6

b. For the given shear force diagram develop the loading diagram and draw bending moment diagram indicating silent features. 12

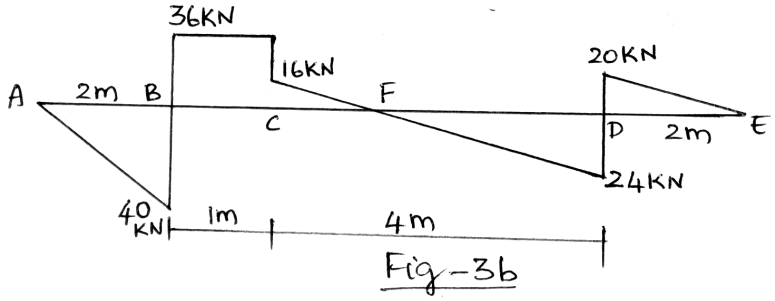


Fig-3b

c. Draw shear force and bending moment diagram for the beam shown in Fig.3(c). 12

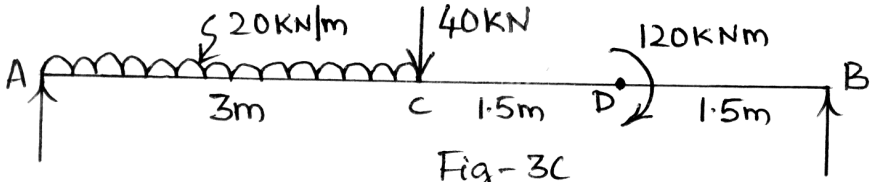


Fig-3C

UNIT - IV **18**

4 a. With a neat sketch obtain the expression for section modulus in case of hollow rectangular and hollow circular tube sections of uniform thickness. 9

b. A circular steel pipe of external diameter 60 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2 m. If permissible stress in steel is 150 N/mm^2. Determine the maximum concentrated load that can be carried by it at mid span. 9

c. A T-section beam shown in Fig.4(c) is subjected to a shear force of 9 kN at a section. Determine the amount of maximum shear stress and draw the distribution of shear stress across the depth of the section. 9

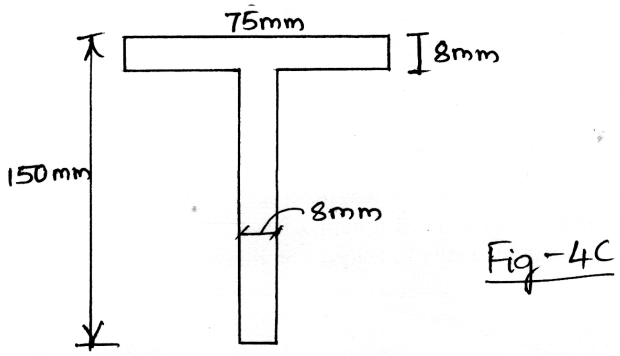


Fig-4C

UNIT - V **18**

5 a. Derive Euler's buckling load for one end fixed and other end hinged column. 9

b. Determine the buckling load for a strut of tee section, the flange width being 100 mm, overall depth 80 mm and both flange and stem 10 m thick. The strut is 3 m long and is hinged at both ends. Take; E = 200 GN/m^2. 9

c. During tests on a sample of steel bar 25 mm in diameter, it is found that the pull of 50 kN produces on extension of 0.095 mm on a length of 200 mm and a torque 200 Nm produces an angular twist of 0.9 degrees on a length of 250 mm. Find the Poisson's ratio of the steel. 9

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