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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.	2
b.	What do you mean by Principle stresses?	2
c.	Define point of Contra flexure.	2
d.	What is meant by neutral Axis?	2
e.	Define polar modulus.	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	Illustrate the behavior of mild steel under gradually increasing load with a Stress-Strain Curve.	9
b.	A bar of 20 mm diameter is loaded as shown in Fig. 2(b). Determine the stresses in each pair and the total elongation. Take E = 210 GPa.	9
c.	A reinforced concrete column has a square cross-section. It is reinforced with 4 steel rods of 20 mm diameter at each corner. The column carries an axial compressive load of 500 kN. Find the size of column so that the stress in the concrete does not exceed 4 N/mm^2. Find also load carried by steel and stress induced in it. Assume modular ratio $E_S/E_C = 15$.	9
	UNIT - II	**18**
2 a.	Derive the expression for normal and tangential component of stresses on a given plane for a 2D stress system.	9
b.	Derive Lame's equation with usual notation for thick cylinder.	9
c.	A cylinder vessel whose ends are closed by means of rigid flange plates of steel plate 3 mm thick. The length and internal diameter are 500 mm and 250 mm respectively. Determine the longitudinal and circumferential stresses in vessel due to an internal fluid pressure of 3 MN/m^2. Also calculate increase in length, diameter and volume of the vessel.	9

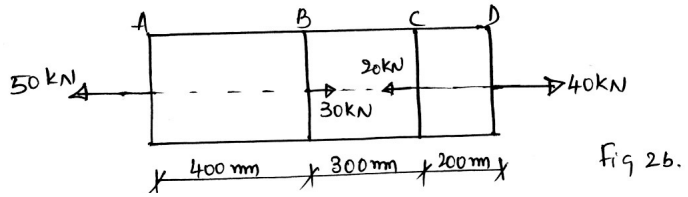


Fig 2b.

Contd…2

UNIT - III **18**

3 a. Define shear force, bending moment, BMD, SFD. 6

b. Draw BMD and SFD for the beam shown in Fig. 4b. Locate points of Contra flexure if any. 12

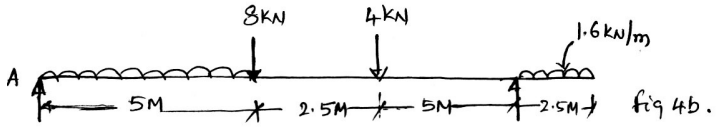
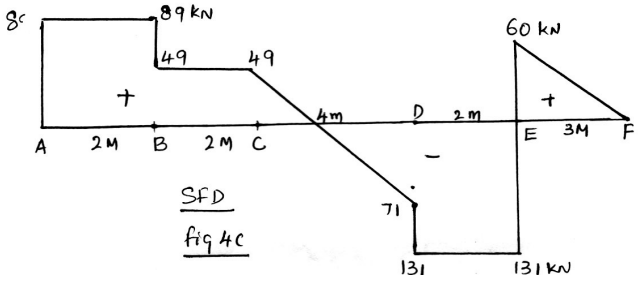


fig 4b.

c. Sketch the loaded diagram from the Shear force diagram given below Fig. 4c. Also draw BMD and locate the point of contra flexure if any. 12



SFD
fig 4c

UNIT - IV **18**

4 a. Derive $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notatins. 9

b. A wooden beam 10 m long 360 mm deep and 300 mm wide is simply supported. It is subjected to a UDL. Find the safe load it can carry, if factor of safety is 6 and maximum intensity of stress induced in the material is limited to 60 MPa. 9

c. Draw the Shear stress distribution for the beams of an I section stress in Fig 5c. Calculate the ratio of maximum shear stress to average Shear stress at a section where the Shear force is 200 kW. 9

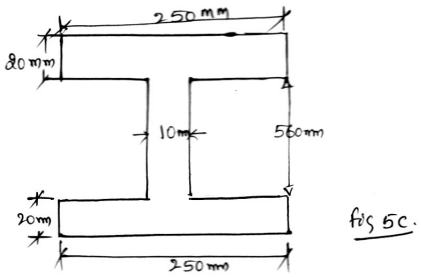


fig 5c.

UNIT - V **18**

5 a. Derive $\frac{T}{I_p} = \frac{f_s}{R} = \frac{C\theta}{L}$ with usual notatins. 9

b. Determine the diameter of a shaft which will transmit 440 kW at 280 rpm. The angle of twist must not to exceed is limited 1°/m length and the maximum torsional shear stresses is limited to 40 N/mm^2. Take C = 84 kN/mm^2. 9

c. A 1.5 m long C.I column has a circular cross section of 50 mm diameter. One end of the column is fixed in direction and other end is free. Taking FOS = 3, calculate state load using 9

i) Rankine's formula: Take f_c = 560 MN/m^2 and $a = \frac{1}{1600}$ for pinned ends.

ii) Euler's formula : E_{CI} = 170 GN/m^2

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