CBCS Scheme

USN | | | | | | | | | | |

15MT33

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Mechanics of Materials

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define the following:
i) Poisson's ratio ii) Hooke's law
iii) Proof stress iv) Shear stress **(08 Marks)**

b. The tensile test was conducted on a mild steel bar the following data was obtained from the test:
Diameter of steel bar = 16 mm Gauge length of the bar = 80 mm
Load at proportionality limit = 72 kN Extension at a load of 60 kN = 0.115 mm
Load at failure = 80 kN Final gauge length of bar = 104 mm
Diameter of the rod at failure = 12 mm.
Determine: i) Young's modulus ii) Proportionality limit
iii) True breaking stress iv) Percentage elongation **(08 Marks)**

OR

2 a. Derive the expression for analysis of deformation of uniformly tapering circular bar. **(08 Marks)**

b. Find the extension of the bar as shown in Fig.Q2(b) under axial load of 20 kN, E = 200 GPa.

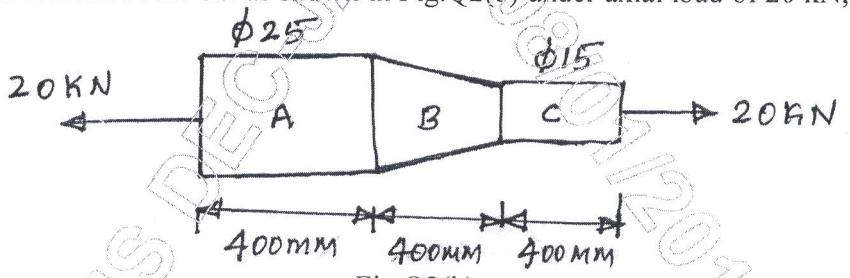

Fig.Q2(b) **(08 Marks)**

Module-2

3 The state of stress in a 2D stressed body as shown in Fig.Q3. Determine principal stress, principal planes, maximum shear stress, verify your answers by constructing Mohr's circle.

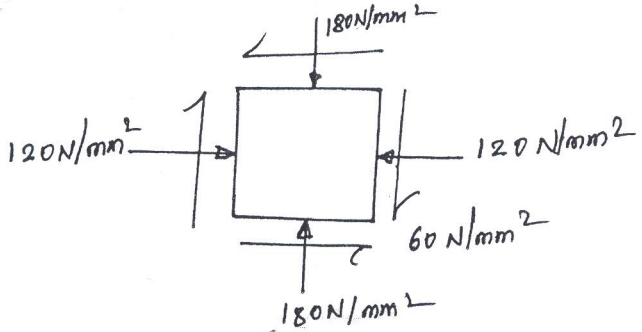

Fig.Q3 **(16 Marks)**

OR

4 A pipe of 500 mm internal diameter and 75 mm thick cylinder is filled with a fluid at a pressure of 6 N/mm^2. Find the maximum and minimum hoop stress across the cross section of the cylinder also sketch the radial pressure and hoop stress distribution across the section. **(16 Marks)**

Module-3

5 a. Define beam. Explain types of beams. **(04 Marks)**

b. A cantilever beam of length 2m carries a point load as shown in Fig.Q5(b). Draw the shear force and bending moment diagram.

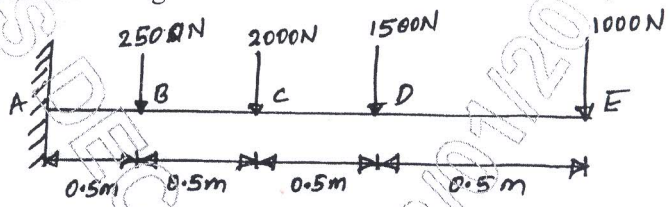

Fig.Q5(b) **(12 Marks)**

OR

6 A simply supported beam AB of span 6m is loaded as shown in Fig.Q6. Draw SFD and BMD.

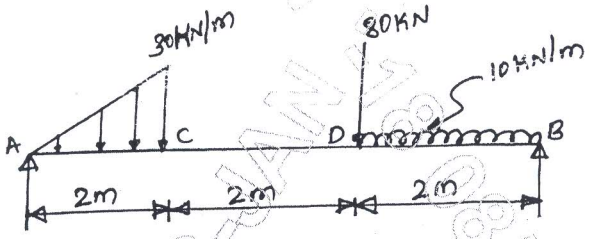

Fig.Q6 **(16 Marks)**

Module-4

7 a. Explain theory of pure bending. **(04 Marks)**

b. With assumption derive bending moment equation $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ **(12 Marks)**

OR

8 a. Derive the expression for Eulers Bernoulis equation for deflection. **(08 Marks)**

b. Derive an expression for deflection of Cantilever beam with point load at the free end. **(08 Marks)**

Module-5

9 a. Write the assumptions and derive the expression for torsion equation for a circular shaft. **(10 Marks)**

b. A hallow circular shaft 200 mm external diameter and metal thickness 25 mm is transmitting power at 200 rpm. The angle of twist over a length of 2m was found to be 0.5°. Calculate the power transmitted and the maximum shear stress induced. Take G = 84 kN/mm^2. **(06 Marks)**

OR

10 a. With usual notations derive Rankine's formula. **(10 Marks)**

b. Explain assumptions in Euler's column theory. **(06 Marks)**

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