SE SEM III Civil CBCS

Q.P.Code: 27317

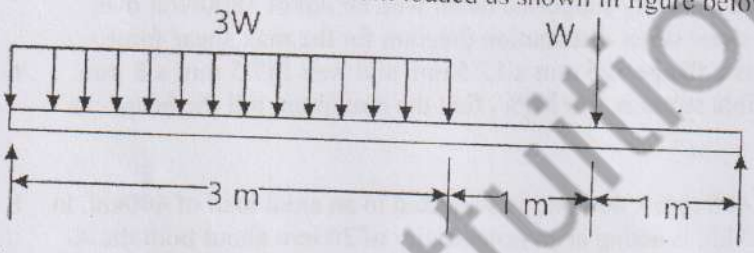
4 DEC 2018

(3 hours) Total Marks :80

NOTE:
1. Question No 1 is compulsory. Answer any 3 from remaining 5 questions
2. Illustrate you answers with neat sketches where ever necessary
3. Assume suitable data wherever necessary if not given. However justify the same

1. Answer the following (any 4) 20
   a) State the assumptions made in theory of simple bending
   b) State the relationship between modulus of elasticity, modulus of rigidity and bulk modulus.
   c) Explain the concept of : Beam with Uniform Strength
   d) Locate the core (kernel) of a rectangular section of 300 mm x depth 700 mm
   e) Draw shear stress distribution diagram for , T(inverted) ,C (channel) ,and I (symmetrical & un symmetrical) section

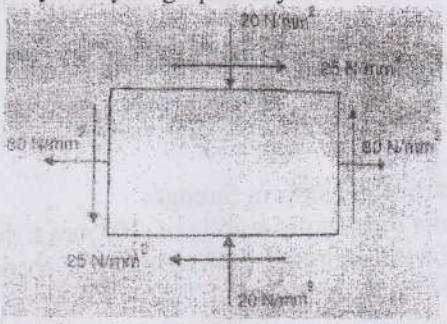
2. a) Draw SFD and BMD for the beam loaded as shown in figure below. 8



   b) A steel bar 25 mm diameter and length 250 mm is pulled by 0.001 mm by application of tensile load. Find the diameter of the bar if the linear strain is to be reduced by 10% without changing the load. 6
   c) A rectangular block is loaded as shown. Find the change in dimension and also the change in volume. Take Es = $2x10^5$ N/mm^2 and Poisson's ratio = 0.25 . Given AB=300 mm , BC = 150 mm & BE = 100 mm 6

3. a) A copper rod 36 mm in diameter is encased and rigidly attached at the end of a steel tube which is 50 mm external diameter, thickness of metal being 5 mm. The composite section is then subjected to an axial pull of 100 kN. Find the stresses induced in each metal and extension on the length of 1.5m .Take $E_s = 2x10^5$ N/mm^2 and $E_c = 1.1x10^5$ N/mm^2 8
   b) In an experiment a bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension of the gauge length is 200 mm and is 0.09 mm and the change in diameter is 0.0039 mm. Calculate the Poisson's ratio and the values of the 3 modules. 6
   c) A steel bar consists of 2 equal portions 1 m long. The respective diameters of each portions being 30 mm and 50 mm. Find the total strain energy of the bar when it is subjected to an axial pull is of 150 kN. Take Es = $2x10^5$ N/mm^2 for steel . 6

4. a) A plane element in the body is subjected to the stresses as shown in the figure. Determine the principle stresses and their directions as well as the maximum shear stresses and the directions on which they occur. Sketch the stresses on properly oriented planes. Solve analytically or graphically. 8



b) A cast iron beam is of T section. Flange: 100mm x 20mm , web 20mm thick , overall height 140mm . Loaded as a Simply supported beam with an udl of 1800N/m over entire span of 8m. Draw shear stress distribution diagram for the max shear force. 6

c) A T beam of span 5 m has a flange 125 mm x 12.5 mm and web 187.5 mm x 8 mm. If the maximum permissible stress is 150 MPa , find the maximum udl the beam can carry 6

5. a) A square column of size 400 mm x 400 mm is subjected to an axial load of 400kN. In addition to this load of 40 kN is acting at an eccentricity of 20 mm about both the X-X &Y-Y . Find the stresses at all corners. 8

b) 450 kW Power has to be transmitted at 100 rpm . Find 8

i) The necessary diameter of a solid shaft

ii) The necessary diameters of a hollow circular section having inside diameter being ¾ of the external diameter. Allowable shear stress = 75 N/mm^2

c) Derive No Tension condition for a rectangular section 4

6. a) A cylindrical shell 1 m in diameter and 3 m in length has a metal thickness of 10 mm. If it is subjected to an internal pressure of 3 N/mm^2 , determine change in length , change in diameter and change in volume . Take Es = $2x10^5$ N/mm^2 and Poission's ratio = 0.3 8

b) Find Euler's Crippling load for a hollow cylindrical column of 50 mm external diameter and 5 mm thick. Both ends of the column are hinged and length of column is 2.5 m . Take Es = $2x10^5$ N/mm^2 . Also determine Rankine's crippling load for the same colum . Take fc= 350 MPa and Rankine's constant α = 1/7500 8

c) State the various end conditions of column 4