Code: 13A01401 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December/January 2015/2016

STRENGTH OF MATERIALS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define principal plane and principle stresses.

(b) State maximum strain energy theory.

(c) A cast iron pipe of 750 mm diameter is used to carry water under a head of 60 m. Determine the thickness of the pipe if the permissible stress is to be 20 MPa.

(d) What are the assumptions made in Lame' theory?

(e) Define torsional moment of resistance.

(f) Define stiffness of spring and mention types of springs.

(g) What are the limitations of Euler' formula?

(h) Define slenderness ratio of column. What is its importance?

(i) Mention the assumptions made in unsymmetrical bending.

(j) What is meant by shear centre?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 The stresses on two perpendicular planes through a point in a body are 160 MPa and 100 MPa, both compressive along with shear stress of 80 MPa. Determine: (i) The normal and shear stress on plane inclined 30^0 to the plane of 160 MPa stress and also resultant stress and its direction. (ii) The normal stress on a plane at 90^0 to the inclined plane in (i).

OR

3 Principal stresses at a point in an elastic material are 100 MPa tensile, 50 MPa tensile and 25 MPa compressive. Determine the factor of safety against failure based on various theories. The elastic limit in simple tension is 220 MPa and poison's ratio 0.3.

UNIT – II

4 A closed–end copper tube of 72 mm internal diameter, 800 mm long and 2 mm thick is filled with water under pressure. Find the change in pressure if additional volume of 4000 mm^3 of water is pumped into the tube. Neglect any distortion of the end plates. Take E = 102 MPa, K = 2200 MPa and poison's ratio 0.3.

OR

5 A steel tube of 120 mm external diameter is shrunk on another steel tube of 48 mm internal diameter. After shrinking the diameter at the junction is 80 mm. Initial differences of diameters at the junction before shrinking was 0.04 mm. Determine: (i) Radial pressure at the junction. (ii) Hoop stress developed in the two tubes after the shrinking. Take E = 200 GPa

Contd. in page 2

UNIT – III

6 (a) Hollow shaft transmits 200 kW of power at 150 rpm. The total angle of twist in a length of 5 m of the shaft is 3^0. Find the inner and outer diameters of the shaft if the permissible shear stress is 60 MPa. Take G = 80 GPa.

(b) An 800 mm long shaft with a diameter of 80 mm carries a flywheel weighing 4 kN at its mid way. The shaft transmits 24 kW at a speed of 240 rpm. Determine the principal stresses and the maximum shear stress at the ends of the vertical diameter in a plane near the flywheel.

OR

7 (a) A close-coiled helical spring absorbs 72 N-m when compressed through 60 m. There are 8 coils in the spring. The coil diameter is 10 times the wire diameter. Find the diameters of the coil and wire and the maximum shear stress. G = 82 GPa.

(b) The length of the largest plate of a semi-elliptical spring is 800 mm. The central load is 5.5 kN and the central deflection is 20 mm. The allowable bending stress is 200 MPa and the width of the plates is 10 times the thickness. Determine: (i) Thickness and width of plates. (ii) Number of plates.

UNIT – IV

8 Derive the expression of Euler's crippling load for column hinged at one end and fixed at the other end

OR

9 A tubular strut pin-jointed at both the ends has outer and inner diameters as 40 mm and 36 mm respectively and is 2.4 m long. Compare the crippling loads given by Euler's and Rankine's formulae. E = 204 GPa; yield stress = 310 MPa; a = 1/7500. If the elastic limit stress is taken as 220 MPa, find the length below which the Euler's formula ceases to apply.

UNIT – V

10 A beam is loaded as shown in figure 1a and figure 1b. Determine the maximum deflection and stress at B. Take E = 210 GPa.

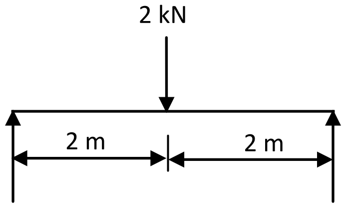


Figure: 1a

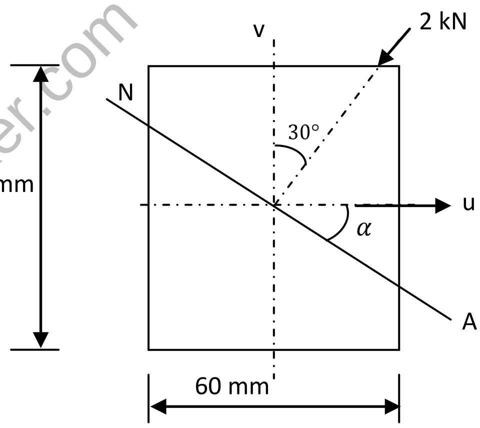
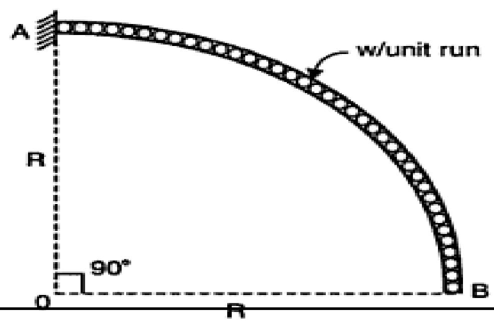


Figure: 1b

OR

11 A curved beam of uniform cross section is horizontal in plan and in the form of quadrant of a circle radius R. The beam is fixed at A and free at B. It carries a uniformly distributed load of w/m length over the entire length of the beam as shown below. Calculate the shear force, bending moment and twisting moment values at A and B



*****