(DCE 214)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

CIVIL ENGINEERING

Paper - IV : Strengths of Materials - I

Time : 3 Hours **Maximum Marks : 75**

Answer question No. 1 is compulsory ***(15)***

Answer ONE question from each unit ***(4 x 15 = 60)***

1) a) Define stress and strain.

b) Define strain energy.

c) Define volumetric strain.

d) What is elastic limit.

e) For the given beam find reactions at supports; beam AB of length '*l*' carrying a central point load '*w*' with simple supports at the ends.

f) Define Bulk modulus.

g) What is meant by factor of safety.

h) Explain Hooke's law.

i) Define torsional rigidity.

j) What is pure bending.

k) Define lateral strain.

l) What is shear centre.

m) What is fitched beam.

n) What is the relation between young's modulus, shear modulus and bulk modulus.

o) What do you mean by principle of super position.

Unit – I

2) A steel rod 18 mm in diameter passes centrally through a steel tube 25 mm in internal diameter and 30 mm in external diameter. The tube is 750 mm long and is closed by rigid washers of negligible thickness which are fastened by nuts threaded on the rod. The nuts are tightened until the compressive load on the tube is 20 kN. Find the stresses in the tube and the rod. Find the increase in these stresses when one nut is tightened by one quarter of a turn relative to the other. There are 4 threads per10 mm, $E = 200\ kN/mm^2$. ***(15)***

OR

3) a) Deduce a formula for the elongation of a prismatic bar under the action of its own weight.

b) Three equal vertical rods 45 mm diameter each jointly supported a load of 1600 kN. The middle rod is made of steel and the end rods are made of copper. Each rod is 3 m long and the rods are such spaced that each rod shares equal amount of load. Now an additional load of 1600 kN is attached to the rods through a platform attached at the bottom of the ends. Determine the final stress setup in each rod. Take 'E' for steel as $2 \times 10^5\ N/mm^2$ and 'E' for copper as $100 \times 10^5\ N/mm^2$. ***(8)***

Unit – II

4) A horizontal beam 10 m long carries a UDL of 180 N/m and in addition a concentrated load of 200 N at the left end. The beam is supported at 2 points 7 metre apart, so chosen that each support carries half the total load. Draw the S.F.D. and B.M.D. ***(15)***

OR

5) A beam of span L, simply supported at the ends, is loaded with a triangular load with intensity zero at one end to 'w' per unit length at the other end. Plot the shear force and bending moment diagrams, indicating the principle values. ***(15)***

Unit – III

6) A timber beam is freely supported on supports 6 meters apart. It carries a U.D.L. of 12 kN/m run and a concentrated load of 9 kN at 2.5 m from the left support. If the stress in timber is not to exceed $8\ N/mm^2$, design a suitable section making the depth twice the width. ***(15)***

OR

7) A beam of square section is placed horizontally with one diagonal placed horizontally. If the shear force at the section of the beam is 'S', draw the shear stress distribution diagram for the section. ***(15)***

Unit – IV

8) A hallow shaft with diameter ratio 3/5 is rearrived to transmit 450 kW at 120 rpm with a uniform twisting moment. The shearing stress in the shaft must not exceed 60 N/mm^2 and the twist in a length of 2.5 m must not exceed 1. Calculate the minimum external diameter of the shaft satisfying these conditions. Take $C = 8 \times 10^4$ N/mm^2. ***(15)***

OR

9) A weight of 350 N is dropped through a height of 800 mm on to a closely coiled compression spring which is instantaneously compressed by 200 mm under the impact. If the diameter of the rod with which the spring is made is 25 mm and the mean coil radius of the spring is 100 mm. Find the maximum instantaneous stress produced by the impact and the no. of coils in the spring. Take $C = 0.80 \times 10^5$ N/mm^2. ***(15)***

⌘⌘⌘