* K C - 6 1 6 7 *

KC-6167

B. E. - II (Sem. III) (EC & Comp.) Examination

November / December – 2012

Strength of Materials

Time : **3** Hours] [Total Marks : **75**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. 3) (EC & COMP.)

Name of the Subject :

☛ STRENGTH OF MATERIALS

☛ Subject Code No. : 6 1 6 7 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Programmable calculator is not permitted.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if required and mention it clearly.

1 (a) Complete the following with proper words/expression 8

(1) The strength of hollow shaft for same length, material and weight is _____ than solid shaft.

(2) Factor of safety is defined as the ratio of _____.

(3) Hook's Law is valid only for _____ materials.

(4) The thermal stress developed in a material is _____ proportional to the change in temperature.

(5) Modulus of elasticity is the ratio of _____.

(6) The torsional rigidity of a circular shaft is equal to _____.

(7) Cast iron is more _____ than mild steel.

(8) The property which enables a material to spring back to its original shape and size after the removal of load is called _____.

(b) Attempt an **two** :

(i) A steel bar 300 mm long 50 mm wide and 40 mm thick is subjected to a pull of 300 kN in the direction of its length. Determine the change in volume. Take E = 2×10^5 N/mm^2 and μ = 0.25. 8

(ii) A rod tapers uniformly from 40 mm to 22 mm in diameter in length of 400 mm. If the rod is subjected to an axial load of 40 kN, find the extension of the bar. Take E = 200 GPa. 8

(iii) A reinforced short concrete column 250 mm × 250 mm in section is reinforced with 8 steel bars The total area of steel bars is 2500 mm^2. The column carries a load of 390 kN If the modulus of elasticity for steel' is 15 times that of concrete find the stresses in concrete and steel. 8

2 Attempt any two :

(i) A solid steel shaft has to transmit 75 kW at 200 r.p.m. Taking allowable shear stress as 70 N/mm^2, find suitable diameter for the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%. 8

(ii) A hollow shaft is to transmit 300 kW at 80 r.p.m. If the shear stress is not to exceed 60 MN/m^2 and internal diameter is 0.6 of the external diameter find the external and internal diameter assuming that the maximum torque is 1.4 times the mean. 8

(iii) A composite bar as shown in figure is held between two rigid supports. If the temperature of this bar is raised through 14° Celsius and $\alpha_\beta = 20 \times 10^{-6}/°C$, $\alpha_s = 11 \times 10^{-6}/°C$, $E_B = 85\,GPa$ and $E_S = 210\,GPa$ find the force exerted on supports. 8

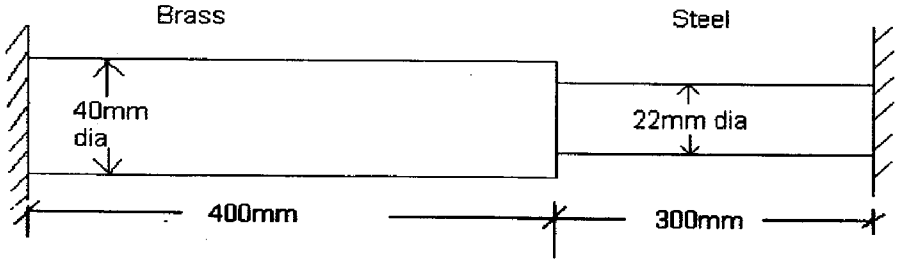

Fig.

3 Attempt following : (any **four**) 8

(1) At the point of zero shear force, the bending moment is _____.
(Zero, Maximum, Minimum)

(2) Define overhanging beam.

(3) State any two assumptions of bending theory.

(4) State the name of statically determinate beams.

(5) The bending stress is zero at _____ and maximum at _____.
(Bottom layer, Inner layer, Neutral Axis)

(6) In cantilever beams, the tensile stress is developed at _____ and compressive stress at _____.
(Top layer, Bottom layer, Neutral layer)

4 Attempt following : (any **three**) **27**

(1) Draw shear force and bending moment diagrams of beam shown in fig.

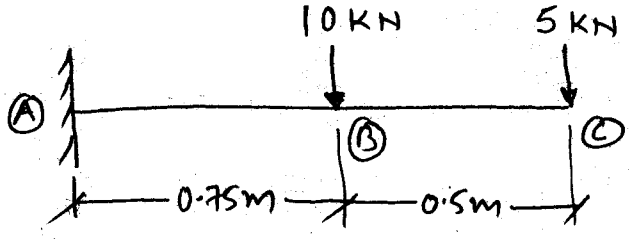

Fig.

(2) Draw shear force and bending moment diagrams of beam shown in fig.

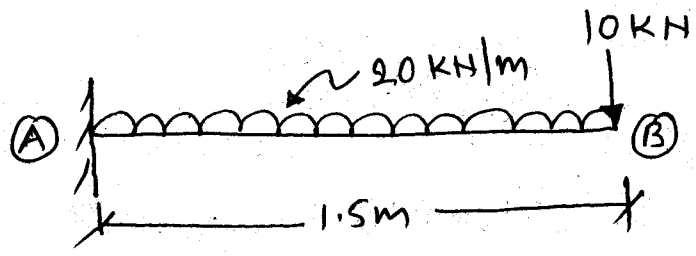

Fig.

(3) Draw shear force and bending moment diagrams of beam shown in fig.

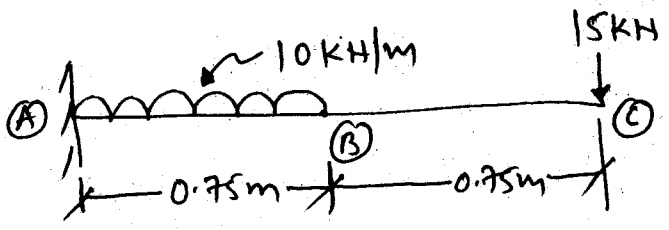

Fig.

(4) The C/S of a joist is a T-section of size 150mm × 100mm × 15 mm. Find the maximum intensity of shear stress if it has to resist a shear force of 100 kN.