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UF-6167

B. E. II (Sem. III) (E.C. & Comp.) Examination

May / June – 2012

Strength Of Materials

Time : **2** 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) (E.C. & 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**

(i) The ratio of Lateral strain to Longitudinal strain is known as_____.

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

(iii) The percentage elongation is the ratio of _____ to the original gauge length.

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

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

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

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

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

(b) Attempt any two :

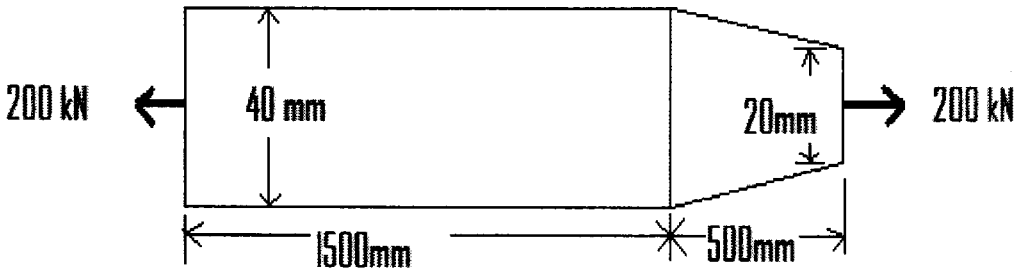
(i) A bar 20 mm × 40 mm in cross section and 400 mm long is subjected to an axial tensile load of 70 kN. It is found that the length increases by 0.176 mm and the lateral dimension of 40 mm decreases by 0.0044 mm. Find : 8

(a) Young's Modulus

(b) Poisson's ratio and

(c) Change in the 20 mm dimension.

(ii) A 2m long steel bar is having uniform diameter of 40 mm for a length of 1.5 m and in the next 0.5 m its diameter gradually reduces from 40 mm to 20 mm as shown in figure. Determine the elongation of this bar when subjected to an axial tensile load of 200 kN. Take E = 2 × 10^5 N/mm^2. 8



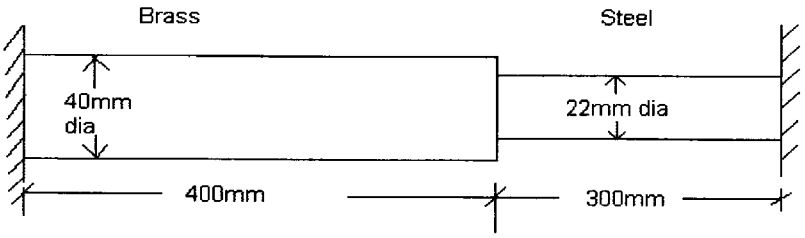
(iii) A reinforced concrete column of size 300 mm × 500 mm has –8 bars of 16 mm diameter. If the column is subjected to an axial compressive force of 800 kN, find the stresses developed in steel and concrete. Take E_S = 18 E_C.

2 Attempt any two :

(i) A solid steel shaft has to transmit 100 kW at 200 r.p.m. Taking allowable shear stress as 80 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 320 kW at 80 r.p.m. If the shear stress is not to exceed 70 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 20° Celsius and $\alpha_B = 20 \times 10^{-6}/°C$, $\alpha_S = 11 \times 10^{-6}/°C$, $E_B = 85$ GPa and $E_S = 210$ GPa find the force exerted on supports. 8



3 Attempt following : (any four) 8

(i) Define point of contraflexure.

(ii) Define cantilever beam.

(iii) State the equation of bending.

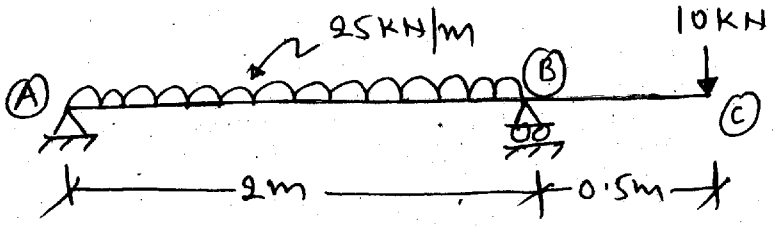
(iv) State the name of statically indeterminate beams.

(v) The shear stress is maximum at _____ and zero at _____.
(Top layer, Neutral layer, Inner layer)

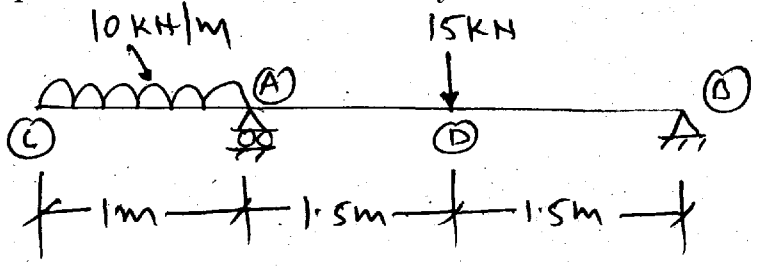
(vi) In simply supported beam, the tensile stress is developed at _____ and compressive stress at _____.
(Top layer, Bottom layer, Neutral layer)

4 Attempt following : (any three) 27

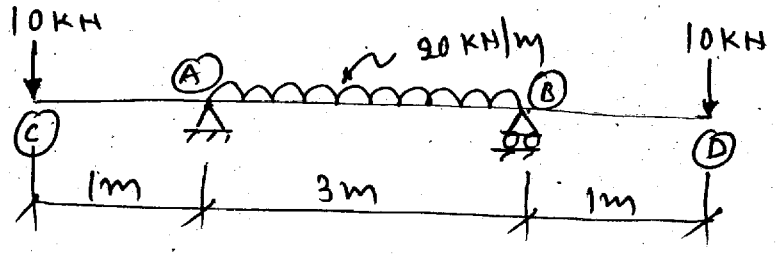
(i) Draw shear force and bending moment diagrams of a beam shown in fig and locate point of contraflexure if any.



(ii) Draw SFD and BMD of beam shown in fig. Also locate point of contraflexure if any.



(iii) Draw SF and BM diagrams of a beam shown in fig. Locate point of inflexion also if any.



(iv) The simply supported beam of span 3.0 m is subjected to U.D.L. of 25 kN/m throughout its length. The beam has C/S 250 mm × 500 mm, determine maximum bending stress and draw stress distribution diagram.
