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RN-6167

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

May / June – 2010

(AM-305 EC/CO) 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) (E.C. & COMP.)**

Name of the Subject :

☛ **(AM-305 EC/CO) Strength of Materials**

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

Seat No. :

Student's Signature

(2) Figure to the right indicate full marks.
(3) Programmable calculators are not allowed
(4) Assume additional data if required and mention it clearly.

SECTION - I

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

(i) The relation between E (Young's Modulus) and K (Bulk Modulus) is given by_____.

(ii) The torsion equation is given by _____.

(iii) Factor of safety is defined as ratio of _____.

(iv) The materials which have the same elastic properties in all directions are called _____ materials.

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

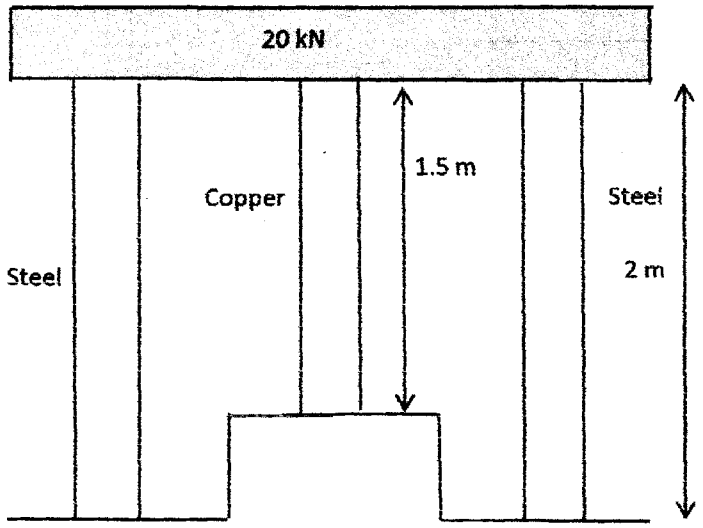
(vi) The ratio of lateral strain to longitudinal strain is known as _____.

(vii) Every cross section of a shaft which is subjected to a twisting moment is under _____ stress.

(viii) The internal resistance developed due to external force is known as _____.

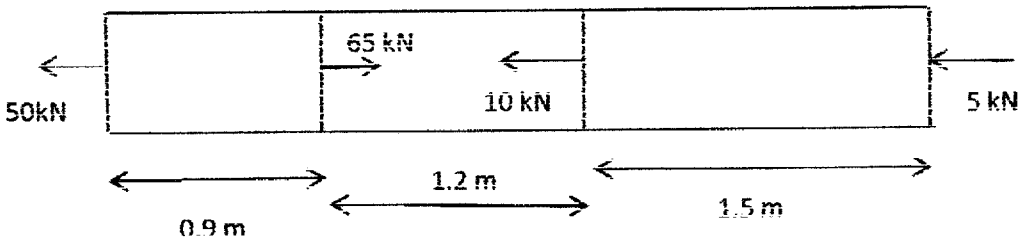
(b) Attempt any **two** : 8

(i) Two steel rods and one copper rod each of 20 mm diameter together support a load of 20 kN as shown in figure. Find the stresses in rods. Take E_{st} = 205 GN/m^2 and E_{cu} = 110 GN/m^2.



(ii) Derive the relation between Modulus of Elasticity (E), Poisson's ratio and Bulk Modulus (K) 8

(iii) A brass bar having cross sectional area of 600 mm^4 is subjected to axial forces as shown in figure. Find out the change in length of bar if Modulus of Elasticity of the bar material is 1.0 × 10^5 N/mm^2. 8

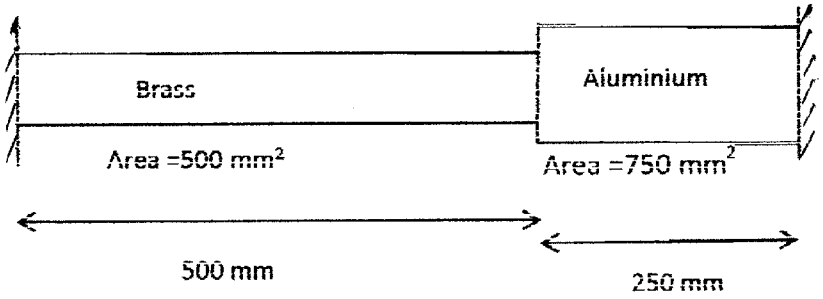


2 Attempt any **two** :

(i) A hollow circular shaft of 150 mm external diameter and thickness 20 mm is rotating at 200 rpm. The angle of twist on 3m length was found to be 0.7°. Calculate the power transmitted and maximum shear stress induced in the material. Take G = 80 GPa. 8

(ii) A solid circular shaft transmits 75 kW power at 200 rpm. Calculate the shaft diameter if the twist in the shaft is not to exceed 1^o in 2m length of shaft and shear stress is limited to 50 MN/m^2. Take C = 100 GN/m^2. 8

(iii) A compound member is rigidly supported between two rigid supports as shown in figure. If the temperature is dropped by 20^oC find stress in each bar. Assume $\alpha_A = 25 \times 10^{6/o}C\ \alpha_B = 20 \times 10^{6/o}C$, E_A = 70 GPa and E_B = 90 GPa. 8



SECTION - II

3 (a) Answer the following : 7

(i) The bending stress is _____ and shear stress is _____ at neutral axis of a beam.

(ii) The internal supports of an overhanging beam will have negative bending moment.(True or False)

(iii) The section modules is define as the ratio of _____

$\left(J/Y,\ K/Y,\ I/Y,\ Y/I\right)$

(iv) The point of zero bending moment is known as the point of maximum shear force. (True or False)

(v) The ratio of maximum shear stress to the mean shear stress in circular c/s beam is _____

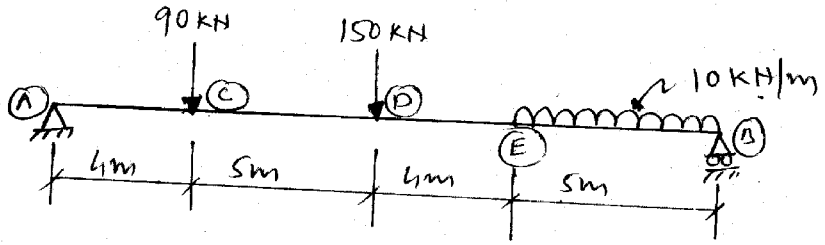
$\left(2/3;\ 4/3;\ 3/4;\ 3/2\right)$

(vi) Give two example of statically determinate beams.

(vii) The bending moment diagram varies linearly between two point loads only. (True or False)

(b) State the assumptions of theory of simple bending. 5

(c) Draw shear force and bending moment diagrams for the beam loaded as shown in figure. 14



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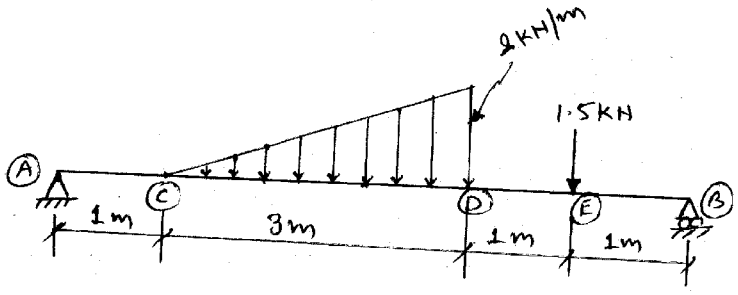

4 Attempt any one from following : **9**

(i) Two wooden planks 150 mm × 50 mm each are connected to form a T-section of a beam. If a moment of 3.4 kN/m is applied around the horizontal neutral axis, including tension below the neutral axis, find the stresses at the extreme fibres of the c/s. Also calculate the total tensile force on the c/s.

(ii) A simply supported beam carries a U.D.L. of intensity 2.5 kN/m over entire span of 5m. The c/s of the beam is T-section having the dimensions 12.5 cm × 20 cm × 2.5 cm (B×D×T). Calculate the maximum shear stress for the section of the beam.