Paper ID : ET30067

END-TERM EXAMINATION, 2014

BTECH (TERM- 03)

SOM1 : STRENGTH OF MATERIALS-I

Time : 3:00 Hours | Maximum Marks: **100**

SECTION A

Total: 30 Marks

Q1 Answer All. **Marks / Q: 3**

(I) State Hookes law.

(II) Briefly explain the concept of the point of the contraflexure.

(III) Define neutral axis of a beam

(IV) Define the terms column and a strut.

(V) Write are the assumptions in Euler's theory of columns

(VI) Find the deflection at the centre of a simply supported beam of length of 3m, loaded with a udl of intensity of 5kN/m throught out. Take E=200GPa and I= 3x 106mm4

(VII) Narrate the limitation of Eulers formula for Buckling of columns

(VIII) Define the term polar modulus. Find the expression for polar , modulus for a hollow shaft.

(IX) A simply supported beam of uniform crosssection is subjected to a maximum bending moment of 22.54kNm. If its cross section is a hollow tube with outer diameter is 40mm and inner 20mm find the value of maximum bending stress.

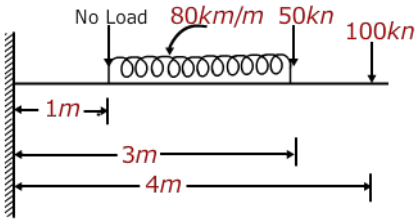
(X) What shall be the area of the bending moment diagram of a simply,supported beam of length L loaded with a concentrated load P at the,middle

SECTION B

Total: 30 Marks

Q2 Answer All. **Marks / Q: 6**

(I) The state of stress at a point in a stresses is given by x=20MPa, y=10MPa and xy=25MPa. Coompute ther principal stresses in material

(II) 

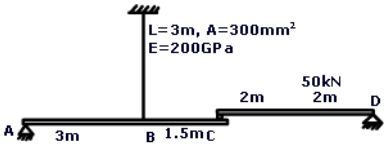
Draw shear force and bending moment diagram for the cantilever shown.

(III) A timber beam of retangular section of length 8m is simply supported. The beam carries a U. D. L of intensity 12 kN/m over the entire length of point load of 10kN at 3 m from the left support.

(IV) A solid circular shaft and a hollow circular shaft whose diameter is 3/4th , of the outside diameter, are of the same material, of equal lengths and are , required to transmit a given torque. Compare the weights of these two , shafts if the maximum shear stress developed in the two shafts is equal.

(V) Find the expression for the crippling load when one end of the , column is fixed and the other end is free.

(VI) The rigid bar ABC and CD are supported by pin supports at A and D and by a steel rod at B, as shown in fig there is a roller connection between the bars at C. Compute the vetical deflection of point C caused by the 50kN load.



(VII) Derive the torison formula T/Ip = T/ = G/L for circular shaft

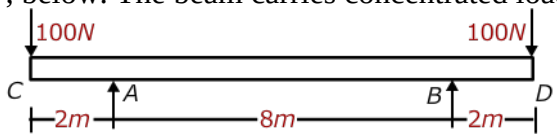
SECTION C

Total: 40 Marks

Q3 Answer Any 4. **Marks / Q: 10**

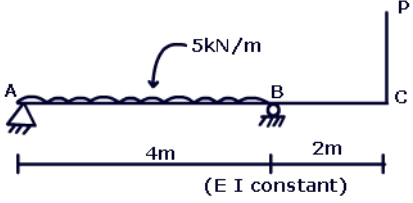
(I) A steel tube of 30 mm external diameter and 20 mm internal diameter , encloses a copper rod of 15 mm diameter to which it is rigidly joined , at each end. If, at a temperature of 10 &oslashC there is no longitudinal , stress, calculate the stresses in the rod and tube when the temperature , is raised to 200&oslashC. Take E for steel and copper as 2.1 10 5 N/mm2 , and 1 105 N/mm2 respectively. The value of coefficient of linear , expansion for steel and copper is given as 11 10 6 per &oslashC and , 18 l06 per &oslashC respectively.

(II) A beam of length 12m is simply supported at two supports which are , 8m apart, with an overhang of 2m on each side as shown in the Fig. , below. The beam carries concentrated loads of 1000N at each end. , Draw S.F. and B.M. diagrams.



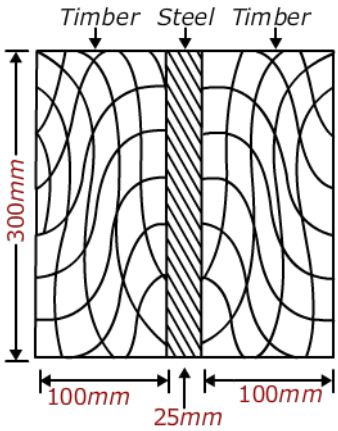
(III) A horizontal cantilever 2m long has its free end attached to a vertical tie rod , 3m long and 300mm2 area. initially unstrained. Determine the load taken up , by the tie rod and the deflection of cantilever at the middle when a , distributed load of 30kN/m is applied to the outer 1m of the beam. , Take I = 6 106mm4 and E = 205GPa for both the beam and the rod.

(IV) The simply supported beam ABC carried the uniformly distributed load between its supports and the concentrated load P at end C. Find the value of P using the moment area method, for which.,A) There is no deflection at C,B) The difection curve at B is horizontal,



(V) Derive the expression for Euler's critical load for a column with boths ends fixed.

(VI) A composite beam is shown in the fig. Determine the resisting moment of , the composite section if maximum stress in timber is limited to 75 N/ , mm2. Also find the maximum centrally applied load which the beam can , carry on a simply supported span of 4 m. Take ESteel = 200 103 N/mm2 ,Etimber = 10 103



N/mm2.