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KC-6265

B. E. - II (Sem. III) (Mech.) Examination

November / December – 2012

Mechanics of Solids - I

Time : **3** Hours] [Total Marks : **100**

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) (MECH.)

Name of the Subject :

☛ MECHANICS OF SOLIDS - 1

☛ Subject Code No. : 6 2 6 5 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Make suitable assumptions wherever necessary.
(3) Figures to the right indicate full marks.
(4) All dimensions are in mm wherever required.
(5) Used of non programmable calculator is permitted.
(6) Explain with neat sketches, if needed.

1 (a) Fill in the blanks : **5**

(i) Shear stress on principal plane is _____. (maximum, zero,)

(ii) Bending Moment is _____ at a hinged support. (Always maximum, always Zero).

(iii) The ratio of direct stress to volumetric strain is known as _____.
(Bulk Modulus, Modulus of elasticity).

(iv) The unit of bending moment is _____.
(KN/mm, KN-m)

(v) At the point of contraflexure _____ changes its sign.
(Shear force, bending Moment, axial force).

(b) Match the following : 5

'A'		'B'	
(1)	Toughness	(a)	Impact
(2)	Rigidity	(b)	Fatigue
(3)	Resistance to penetration	(c)	Hardness
(4)	Endurance limit	(d)	Torsion
(5)	Ductility	(e)	Tension

2 Draw Shear Force and Bending Moment Diagram for a beam loaded as shown in Figure. 10

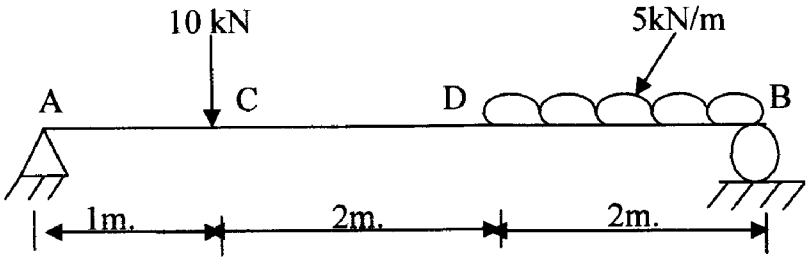

Fig.

3 Attempt any **three** question : 30

(i) A steel bar 1600 mm long is acted upon by forces as shown in fig. below. Find the elongation of the bar. Take E = 210 GN/m^2.

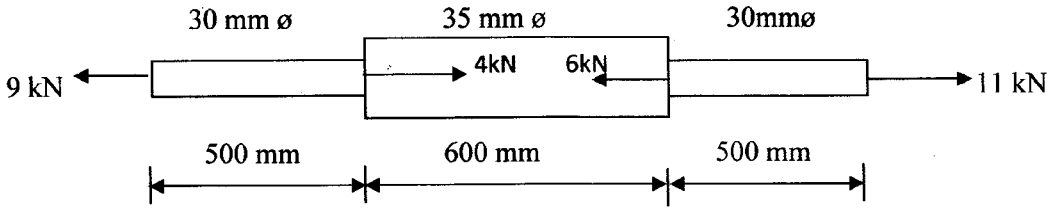

Fig.

(ii) A cantilever beam of span 3m is loaded by a point load 2 kN at its end. The beam has circular cross-section of diameter 100 mm. Determine maximum bending stresses in cantilever beam.

(iii) A 50 mm × 100 mm in depth rectangular section of a beam is s/s at the ends with 2 m span. The beam is loaded with 20 kN point load at 0.5 m from R.H.S. calculate the maximum shearing stress in the beam.

(iv) A rectangular block subjected to a direct tensile stress of 800 N/mm^2 along with a shear stress. Determine the shear stress if major principal stress not to exceed 1200 N/mm^2. (tensile). Also find minor principal stress.

4 (a) Write the following : **10**

(1) Property of material stored strain energy is called _____.

(2) Which factors have to be taken into consideration in calculation of compression member ?

(3) Angle of twist is _____ propositional to twisting moment.

(4) In think shell, ratio of thickness of wall to its diameter is less then _____.

(5) The property of material by which resist impact force called _____.

(6) The area between the load extension curve and extension axis is called _____.

(7) Euler's buckling formula is suitable for _____.

(8) Load required to produced unit deflection is known as _____.

(9) _____ is a cantilever laminated spring.

(10) The ratio of buckling load to safe load know as _____.

5 Solve any **two** : **20**

(1) A laminated spring made of steel has 1000 mm span. It is required to carry a proof load of 12 kN. Maximum permissible bending stress for spring is 200 N/mm^2. And maximum deflection permitted is 50 mm. plates for springs are available in multiples 1 mm thickness and 3 mm width. Determine suitable width, thickness and numbers of plates are required for spring. Also calculate radius to which plate should be formed, assumed width of plates to be equal to 12 times there thickness. Take $E = 2.1 \times 10^5$ N/mm^2.

(2) Find the twist per meter length of a hollow circular shaft 150 mm external diameter and 120 mm internal diameter, if the shear stress is not exceed 50 N/mm^2 take C = 0.8 $\times$ 10^5 N/ mm^2.

(3) Derive and expression for bending stress and deflection for semi-elliptical leaf spring with usual notations.

6 Solve any **two** : 20

(a) An unknown weight fall througth a height of 100 mm on collar rigidly attached to the lower end of a vertical bar 5 m long and 600 mm^2 in section. If the maximum extension of the bar is 3.33 mm what is corresponding stress and magnitude of unknow weight. Take E = 200 GN/mm^2.

(b) A rolled steel joint ISMB 300 is to be used as column of 3.5 m long with both end fixed. Find safe load on column. Take factor of safety 3, σ_c = 320 N/mm^2 and a α = 1/7500. Properties of column section.

Area = 5626 mm^2; I_{xx} = 9.23 $\times$ 10^7 mm^4;
I_{yy} = 4.439 $\times$ 10^7 mm^4.

(c) Derive and expression for change diameter and value of a thickness 60 mm is subjected to an internal fluid pressure of 40 N/mm^2 and external pressure of 4 N/mm^2. Calculate the maximum and minimum circumferential stress and plot the variations.