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UF-6265

B. E. II (Sem. III) (Mechanical) Examination

May/June – 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. II (Sem. III) (Mechanical)**

Name of the Subject :

☛ **Mechanics of Solids - I**

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

Seat No. :

Student's Signature

(2) Make suitable assumption wherever necessary.

(3) Figures to the right indicate full marks.

(4) All dimension are in mm wherever required.

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

(1) The ratio of shear stress to shear strain in known as _____. (Modulus of elasticity, modulus or rigidity, poisson's ratio)

(2) The nature of shear stress distribution in a rectangular beam is _____. (uniform, linear, parabolic)

(3) Hooke's law is valid up to the _____. (elastic limit, yield point, ultimate point)

(4) The slope of the curve of bending moment diagram gives _____. (S.F., B.M.)

(5) At neutral axis bending stress is _____. (maximum, zero, minimum)

(b) State whether the statements are True or False. **5**

(1) When shear force at a point is zero, then bending moment at that point will be minimum.

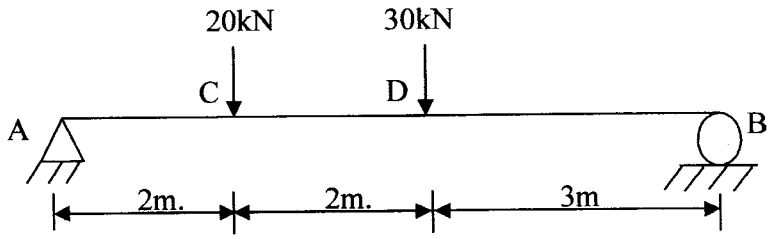
(2) The ratio of direct stress to volumetric strain in called bulk modulus.

(3) Maximum possible value of Poisson's ratio is 0.75.

(4) Strength of beam mainly depends upon section modulus.

(5) A mild steel bar under tension test shows property of malleability.

2 Draw shear force and bending moment diagram for a beam. **10**



3 Attempt any three questions. **30**

(1) A load of 10 kN is to be raised with help of a steel wire. Find the minimum diameter of the wire, if the stress is not to exceed 80 N/mm^2.

(2) A cantilever beam of span 3m and 30 cm × 60 cm rectangular section carries u.d.1. of 40 kN/m on entire span. Find the maximum bending stress.

(3) Two wooden pieces of a section 100mm × 100mm are glued together to form a beam cross-section 100mm wide and 200mm deep. If the allowable shear stress at glued joint is 0.3 N/mm^2. What is the shear force the section can carry ?

(4) At a certain point in a strained material direct stress of 50 MPa (compressive) and 30 MPa (tensile) are acting. Find normal, tangential and resultant stress on a plane inclined at 20^0 to the axis of major stress.

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

(1) Polar modulus of shaft section equal to ratio of polar moment of intertia to _____ of the shaft.

(2) Slenderness ratio is the ratio of _____.

(3) Two spring of stuffiness K_1 and K_2 are connected in series, the stiffness of the composite spring is given by _____.

(4) In case of solid shaft the strain energy in tension, per unit volume is equal to _____.

(5) Maximum stress include in a body due to a sudden applied load is _____ the stress induced when the same load is applied gradually.

(6) In thin sell, ratio of thickness of wall to its diameter is less then _____.

(7) Rankine's constant for mild steel is _____.

(8) The material undergoes considerable deformation without failure it is called _____.

(9) The hoop stress is _____ at inner circumference and _____ at outer circumference of thick cylinder.

(10) The column with one end fixed and other end free, the effective length is _____.

5 Solve any two. **10**

(1) A hollow cylinder cast iron column of 200mm external diameter and 20 mm thick and 5 m long is hinged at both ends. Find the ratio of Euler's and Rankin's critical load. Take $f_c = 500N/mm^2, \alpha = 1/1600, and\ E = 2\times10^5 N/mm^2$

(2) A hollow shaft an inside diameter 60% of its outer diameter is to replaced by a solid shaft transmitting same power at the same speed calculate the percentage saving material. If the material is used is also the same.

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

6 Solve any two. **20**

(1) The 250 N weight fall through a height of 100 mm on collar rigidly attached to the lower end of a vertical bar 3 m long and 25 mm diameter. If the maximum extension of the bar is 3.33 mm what is corresponding stress and magnitude of unknown weight. Thke E = 200 GN/mm^2.

(2) Derive an expression for change in diameter and volume of thin spherical shell due to an internal pressure.

(3) A thick sphear shell of internal diameter 360 mm is subjected to an internal fluid pressure of 40 N/mm^2. If the permissible tensile strength of the shell material is 150 N/mm^2 find required thickness of the shell.