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RN-8189

B. E. - II (Sem. IV) (Civil) Examination

May / June – 2010

Advance Strength of Materials

(Inst. Elective)

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. 4) (Civil)**

Name of the Subject :

☛ **Advance Strength of Materials**

☛Subject Code No. : **8 1 8 9** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Programmable calculator is not permitted.

(3) Figures to the right indicate full marks.

SECTION - I

1 Derive the expression for instantaneous stress developed due to impact loading. **10**

2 Attempt any **two** :

(a) Determine the reactions at support for the beam shown below : **10**

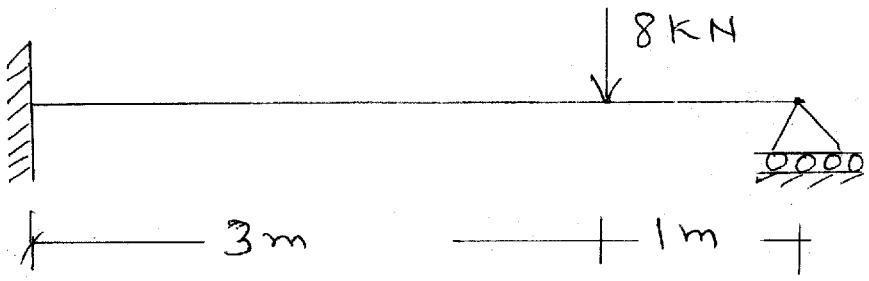

Fig. 1

(b) Derive the expression for deflection of quarter elliptical leaf spring. **10**

(c) A laminated spring 0.9 m long is made of plates each 5 cm wide and 1 cm thick. If the bending stress in the plate is limited to 60 N/mm^2, How many plates would be required to enable the spring to carry a central point load of 2.65 kN ? What is the deflection of spring under this load ? Take $E = 2 \times 10^5$ N/mm^2. **10**

3 Attempt any **two** :

(a) (1) State assumptions made in the theory of bending of curved bars. **4**

(2) Give expression for factor 'm' for trapezoidal, circular and 'T' section. **6**

(b) A curved beam of circular cross section of diameter 30 mm has its center line curved to a radius of 80 mm. Find stresses developed in the beam if the beam is subjected to a bending moment of 100 N-m. **10**

(c) The cross-section of a crane hook is a trapezium with parallel sides 26 mm wide at the inside and 13 mm wide at outside. The depth of the section is 32 mm. The crane hook carries a load of 5 kN, the line of load is at a horizontal distance of 32 mm from the inside edge of the cross-section. The centre of curvature is 38 mm from the inside edge of cross-section. Find the maximum and minimum stresses in the hook.

SECTION - II

Q. 4(A) Attempt the following. 6

1) For a triangular section, the maximum shear stress is _____ the average shear stress.
   (a) 4/3 (b) ½ (c) 3/2
2) The maximum principal strain theory is given by _____.
   (a) Lame Rankine (b) St. Venant (c) Guest and Tresca
3) The hoop stress in case of thick cylinder will not be uniform across the thickness.
   (a) True (b) False
4) In thick cylinder, in order to shrink the inner diameter of the outer cylinder should be slightly _____ the outer diameter of the inner cylinder.
   (a) less than (b) more than (c) equal
5) In the disc of uniform thickness, the hoop stress due to rotation is _____ at the centre.
   (a) Minimum (b) maximum (c) zero
6) In theory of elasticity, the safe stress is equal to ratio of _____ to factor of safety.
   (a) working stress (b) elastic limit stress (c) none of above

(B) Attempt the following. (Any three) 6

1) Define shear centre.
2) What is shrinkage fit allowance?
3) Compare thin shell and thick shell.
4) Define centrifugal force.

(C) Derive the expression for maximum hoop stress of disc with a central hole. 6

Or

(C) Derive the expression for thick cylindrical shell subjected to internal fluid pressure only. 6

Q. 5(A) A steel bolt is subjected to a direct pull of 20 kN and transverse shear force of 10 kN. Take yield point stress for steel 250 Mpa and F.O.S =2 and μ= 0.3. Calculate the diameter of the bolt using,
   (a) Maximum principal stress theory
   (b) Maximum principal strain theory
   (c) Maximum shear stress theory. 8

Or

(A) Find the diameter of a shaft, if it is subjected to maximum B.M. of 9 kN.m and a maximum torque of 12 kN.m at a particular section. The elastic limit stress in simple tension is 180 N/mm^2. Use maximum shear stress theory. 8

(B) The shear force acting on a beam at an I-section with unequal flanges is 50 kN. The section is shown in a figure 1.the moment of inertia of a section about N.A. is 2.849 X

10^4 mm^4. Calculate the shear stress at the N.A. and also draw the shear stress distribution over the depth of the section.

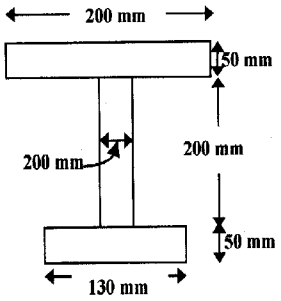

Figure 2

Or

(B) Derive the expression for the location of shear centre of a channel section of uniform thickness t throughout the section. **8**

Q. 6 Attempt any two from the following. **16**

1) The pressure at the outer and inner surface of a thick cylinder are 20 Mpa (gauge) and atmospheric (i.e. zero gauge) respectively. If the hoop stress at the inner surface is 60 Mpa (compressive). Determine hoop stress at the outer surface.

2) A thick cylindrical pipe of outside diameter 300 mm and internal diameter 200 mm is subjected to an internal fluid pressure of 20 N/mm^2 and external fluid pressure of 5 N/mm^2. Determine the maximum hoop stress developed. Draw the variation of hoop stress and radial stress across the thickness indicating the values at every mm interval.

3) A thin steel disc of uniform thickness and of 250 mm diameter with a central hole of 50 mm diameter rotates at 10,000 r.p.m. Calculate the maximum principal stresses and maximum shear stress in the disc. Take $\rho = 7000\ kg/m^3$ and $\mu = 0.3$.