[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2126)

16039(D) - 0 DEC 2016

B. Tech 3rd Semester Examination

Strength of Materials (NS)

CE-211

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

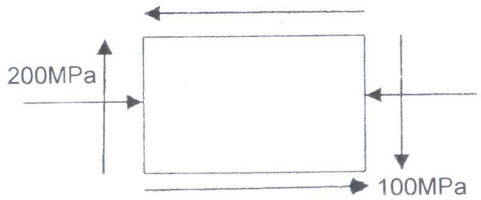
Note : Attempt any five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. Determine the principal stresses when (a) all components of the state stress are equal and (b) the state of stress is

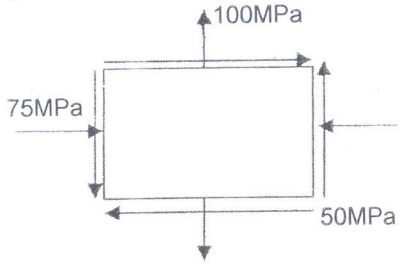
$$\begin{pmatrix} 0 & \tau & \tau \\ \tau & 0 & \tau \\ \tau & \tau & 0 \end{pmatrix}$$ (20)

2. For the given state of plane stress on the surface of a machine component, determine the direction and magnitude of the three principal strains using Mohr's circle for stress. E = 200GPa and G = 80GPa. (20)

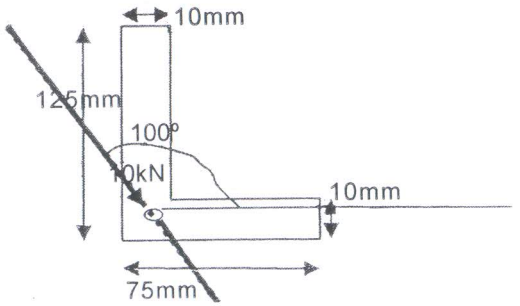


SECTION - B

3. Determine the factor of safety actually used by using steel with yield strength 250MPa for the state of stress shown in figure by using maximum shear stress theory and maximum distortion energy theory. (20)



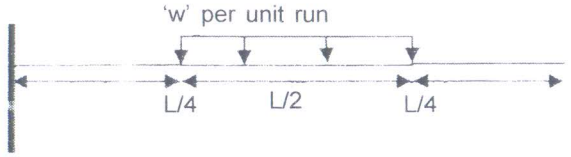
4. A beam having unequal angle section 120 × 80 × 10mm shown in figure is subjected to a concentrated load 10kN at its centre over a simply supported span of 4m. The angle section is placed with its longer leg vertically upward. The concentrated load lies in the plane making angle 100° with the X axis. The load passes through shear centre. Determine the maximum tensile and compressive stresses developed in the cross section at the point of application of load. (20)



SECTION - C

5. Use Macaulay's method to determine the slope and deflection at the free end of the following cantilever which has same flexural rigidity throughout. (20)

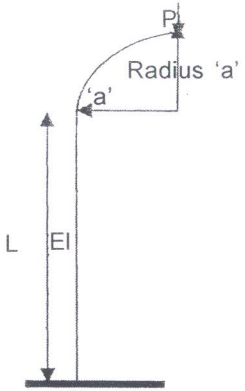
[P.T.O.]



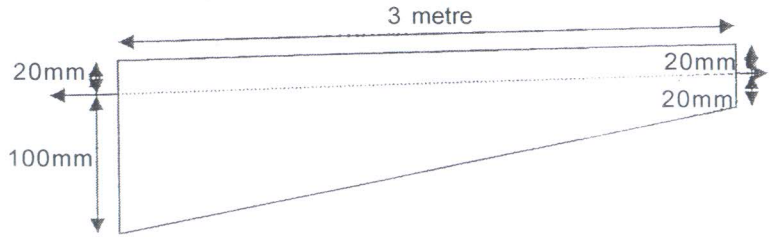
6. A simply supported bar of length 'L' subjected to a uniformly distributed load of intensity 'w' over its entire span deflects Δ at its centre. Determine the buckling load with a factor of safety 'n' when used as strut with both end fixed. (20)

SECTION - D

7. Determine the horizontal and vertical deflection at the free end of the lamp post under load "P". (20)



8. A 3 metre long tie bar of 20mm thick rectangular section is tapered from a depth of 40mm to 120mm at the ends as shown in figure. A load of 25kN is applied through the centroid of the smaller end and parallel to the top edge. Determine the position and magnitude of the maximum tensile stress. (20)



SECTION - E

9. (a) The principal stresses at a point in a strained material are σ_1 and σ_2. Show that the resultant stress on the plane carrying maximum shear stress is

$$\sqrt{\sigma_1^2 + \sigma_2^2}/2$$

(b) At a point in a two dimensional system, the normal stresses on two mutually perpendicular planes are σ_1 and σ_2 and the shear stess is τ. Show that one of the principal stresses is zero if $\tau^2 = \sigma_1\sigma_2$.

(c) State and explain the most practical theory of failure, applicable to ductile materials.

(d) Explain with reasons the limitations of St. Venant's theory of failure.

(e) Define shear centre and its significance.

(f) A cantilever beam carries a point load at mid span. Explain slope and deflection through elastic curve and figure.

(g) A column is fixed at both ends. Explain its effective length through figure.

(h) Explain Castiligano first theorem.

(i) Explain unit load theorem

(j) The resultant of all the forces in a dam falls in the first L/3 from toe, where L is the total base width. Explain the disadvantages of such situation with the help of figure.

(2×10=20)