P - 316

Total No. of Pages : 3

Seat No.	20917

S.E. (Civil) (Semester - IV) Examination, April - 2016
STRUCTURAL MECHANICS (Revised)
Sub. Code : 63344

Day and Date : Sunday, 17 - 04 - 2016 **Total Marks : 100**

Time : 10.30 a.m. to 01.30 p.m.

Instructions : 1) **Attempt all questions.**
2) **Figures to the right indicate full marks.**
3) **Assume any suitable data, if required and clearly mention it.**

SECTION - I

Q1) a) Explain the terms Prinicpal plane and principal stress. **[4]**

b) In a two - dimensional problem the stresses at a point are $\sigma x = 100$ MPa tensile, $\sigma y = 60$ MPa both tensile. If the principle stresses is limited to 150 MPa Find the value of shear stress q. Also find the inclination of the principle plane and magnitude of the maximum shear. **[12]**

Q2) a) Explain middle third rule for rectangular section. **[5]**

b) A masonry retaining wall of trapezoidal section is 10 m high and retains earth which is level upto the top. The width at the top is 2m and at the bottom 8 m and the exposed face is vertical. Find the maximum and minimum intensities of normal stress at the base. Take density of earth = 16KN/m^3, Density of masonry = 24KN/m^3, Angle of repose = 30°. **[13]**

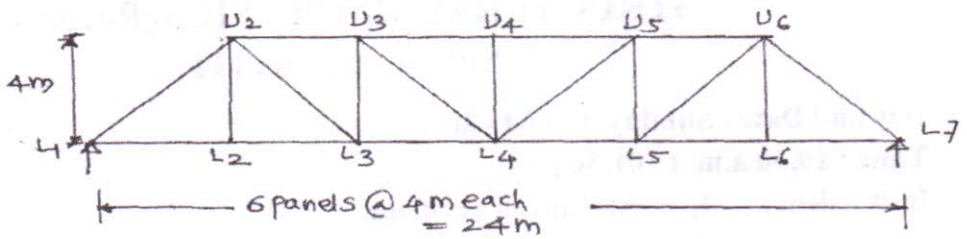
OR

A tapering chimney of hollow circular cross section is 30 m high. Its external diameter at the base is 2.4 m and at the top it is 1.6 m. The chimney is subjected to unifrom wind pressure of 2.2 KN/m^2 of the projected area. If the weight of the chimney is 4000 KN and internal diameter at the base is 0.80 m, determine the maximum and minimum stress intensities at the base. Take k=1.

P.T.O.

Q3) a) What are the uses of influence lines. **[4]**

b) Draw ILD for the forces in the members U2U3, L3L4, U2L3 and U3L3 of the through type bridge truss as shown in fig. below. **[12]**



SECTION - II

Q4) Attempt any Two : **[2 × 9 = 18]**

a) Determine by using Macaulay's method the deflection at C and D in the beam shown in the fig.

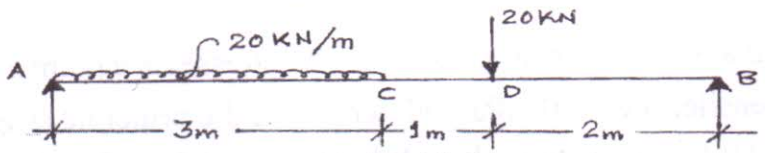


fig. [Q. 4 (a)]

b) Using conjugate beam method, Find the slope at B and deflection at C for the beam shown in fig. Take E = 200 kN/mm^2 and I = 300cm^4

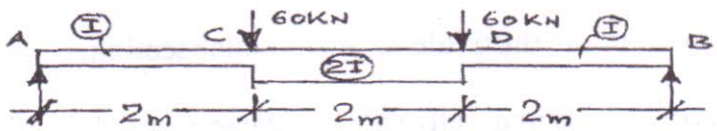


Fig. [Q. 4 (b)]

c) By using double integration method find deflection at the free end of the cantilever shown in fig.

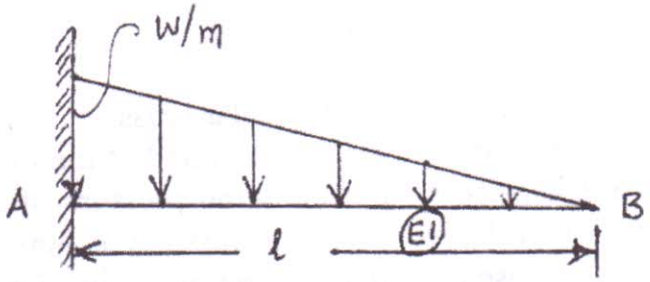


Fig. [Q. 4 (c)]

Q5) a) Explain the equivalent moment and equivalent torque concept and how it is useful in the analysis shafts? **[6]**

OR

The principal stresses in a material are $3\sigma(T), \sigma(C)$ and $1.5\sigma(T)$ in three mutually perpendicular directions find the value of σ at failure according to

i) max. principal strain theory and

ii) max. Shear stress theory. Yield stress = 140 N/mm^2

b) A circular shaft is supported in bearings 3 m apart and transmits 75 kW of power at 150 r.p.m. At 1 m from one end it supports a pulley of 30 kN. Determine the suitable dia. for the shaft if max. direct stress is limited to 100 MPa and max. Shear stress is limited to 50 MPa. **[10]**

Q6) a) State the assumptions made in derivation of Euler's formula. **[4]**

b) A built up column is made up to two channel sections ISJC 200 and two flange plates 25 cm × 1 cm and is 4 m long with both ends fixed, as shown in fig. The properties of the channel section are

i) Area = 17.77 cm^2

ii) Ixx = 1161.2 cm^4

iii) Iyy = 84. 2 cm^4

iv) Dist of centroid from back of the web = 1.97cm

Calculate the load carrying capacity by Rankine's formula with factor of safety 4. Take σ_c = 0.32 kN/ mm^2 and α = 1/7500 **[12]**

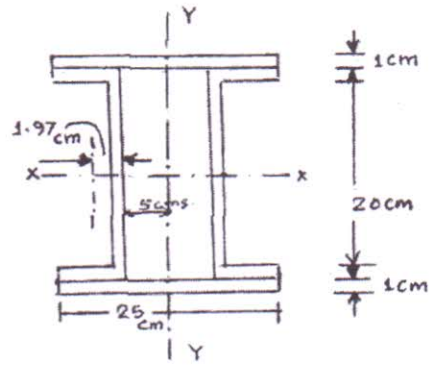


Fig. [Q.6(b)]