SL-239

Seat No.	

Total No. of Pages : 3

S.E. (Civil) (Semester-IV) Examination, April - 2017
STRUCTURAL MECHANICS
Sub. Code : 63344

Day and Date : Tuesday, 25-04-2017 **Total Marks : 100**
Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **Attempt all the questions considering the internal options available, if any.**
2) **Figures to the right indicate full marks.**
3) **Use of non-programmable calculators is allowed.**
4) **Assume any missing data, if necessary and state it clearly.**

SECTION-I

Q1) a) Explain the concept of normal stress, shear stress resultant stress and obliquity of stress on a certain plane. **[4]**

b) At a point in a bracket, the stresses on two mutually perpendicular planes are 35 Mpa (tensile) and 15 Mpa (tensile) respectively. The shear stress across these planes is 9 Mpa. Determine-

The axial, tangential and resultant stress on a plane at 40° to the plane of first stress. **[6]**

The principal stresses and their direction. **[6]**

Q2) a) Explain eccentric loading and behaviour of materials subjected to it. **[4]**

b) A masonry pier, rectangular in shape, measuring 4m along x-axis and 3m along y-axis; is subjected to a compressive force of 50kN at a point located 1 metre away from one of its corners in both the directions. Find the axial load present on the pier , along with the 50kN force, if the minimum stress in the pier is 1.25kN/m^2. What the other corresponding corner stresses? **[14]**

OR

A masonry dam, 1m wide at top and 3m wide at base, is 5 metres in height. Calculate the base pressure intensities when water is retained upto 4 metre height against its vertical water face. Take density of masonry as 19kN/m^3 and density of water as 10kN/m^3. **[14]**

P.T.O.

Q3) A two span continuous beam ABCD is hinged at A,B and D and has an internal hinge at the point C in span BD. The span AB is 5 metres and span BD is 7 metres. Distance BC=2 metres. Construct the influence line diagrams and show their important ordinates for the following quantities-

a) Reaction at intermediate support B
b) Bending moment at intermediate support B
c) Shear force at point E located 2 metres from B in span AB
d) Bending moment at point E located 2 metres from B in span AB [16]

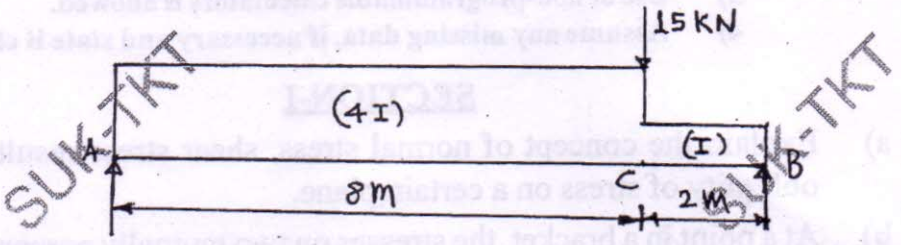
SECTION-II

Q4) a) Calculate the slope and defection at the free end when the cantilever beam is subjected to U.D.L. over the entire span. [6]

b) For the beam as shown in the fig. Determine the following:- [12]

i) Slope at the end A
ii) Deflection at the mid span.
iii) Maximum deflection.

Given $I=8\times10^{-5}$ m^4 & $E=200\times10^6$ kN/m^2.



Q5) a) Derive the equation of equivalent torque and equivalent moment. [4]

b) The direct stresses on two mutually perpendicular planes, in a two dimensional stress system, are σ and 144 MN/m^2. In addition these planes carry a shear stress of 48 MN/m^2.

Assuming the factor of safety on elastic limit as 3.

i) Find the value of σ at which the shear strain energy is least.
ii) If the failure occurs at this value of the shear strain energy, Estimate the elastic limit of the material in simple tension. [12]

OR

A hollow shaft is subjected to a torque of 40KN.M and a bending moment of 30KN.m. The internal diameter of the shaft is one half the external diameter. If the maximum shear stress is not to be exceed 80MN/m^2, find the diameter of the shaft. [12]

Q6) a) Define the term column and strut. [4]

b) Find the greatest length for which a mild steel strut of T-shaped cross section, the area of which is 30cm^2 and the least moment of inertia of which is 240cm^4, may be used with one end is fixed and other entirely free in order to carry a working load of 70MN/m^2 of section, the working load being one fourth the crippling load.

Rankine constants for mild steel are: a=1/7500, σc=330MN/m^2. [12]