(Pages : 3) **A – 4168**

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, June 2016
(2013 Scheme)
13.403 : STRUCTURAL ANALYSIS – I (C)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions : **(5×4=20 Marks)**

1. Obtain an expression for maximum slope and deflection of a simply supported beam subjected to a concentrated load W at mid-span.
2. Explain the terms : Conjugate beam and Conjugate beam method.
3. State the principle of virtual work. Determine the vertical deflection at the free end of a cantilever subjected to a concentrated load at the same point.
4. State the assumptions made in the theory of columns. Explain the limitations of Euler's formula.
5. Derive the condition for the position of u.d.l shorter than the span of the beam, for maximum bending moment at a section.

PART – B

Answer **any one full** question from **each** Module : **(4×20=80 Marks)**

Module – I

6. Determine the slope and deflection under the loads for the simply supported beam shown in Fig. 1. Also determine the position and magnitude of maximum deflection. Take EI = 2.1×10^{15} N-mm^2.

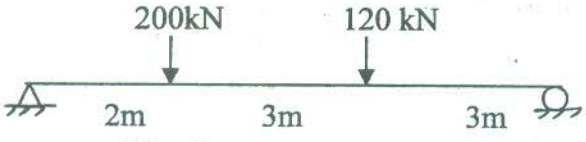

Fig. 1

OR

7. A cantilever 2 m long is of rectangular section 120 mm wide and 240 mm deep. It carries a U.D.L. of 2.5 kN/m length for a length of 1.25 m from the fixed end and a point load of 1 kN at the free end. Assuming E = 10 GN/m^2, calculate the slope and deflection
   i) At the free end of the cantilever and
   ii) At a distance of 1.25 m from the fixed end. Use moment area method.

Module – II

8. Determine the horizontal displacement at support D of the frame shown in Fig. 2. Relative I values are indicated along the members. E = 200 GPa, I = 3×10^{-4} m^4. Use Castigliano's theorem.

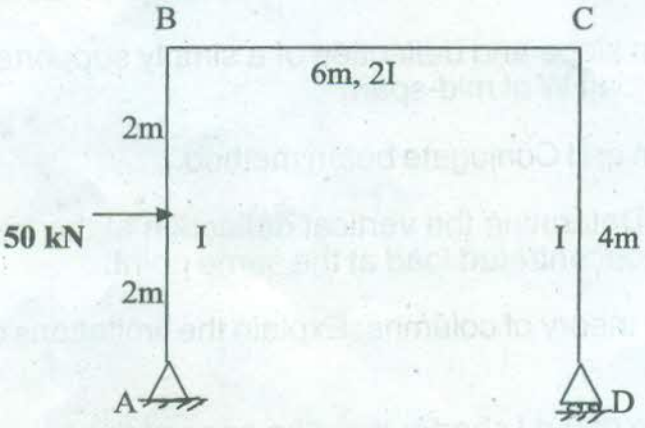

Fig. 2

OR

9. The members of the Warren girder, shown in Fig. 3 are so proportioned that the compression members are stressed to 100 N/mm^2 and tension members to 120 N/mm^2, when a vertical load of 60 kN is applied at L_1. Find the vertical displacement of joint L_1 by virtual work method. Take E = 200 GPa.

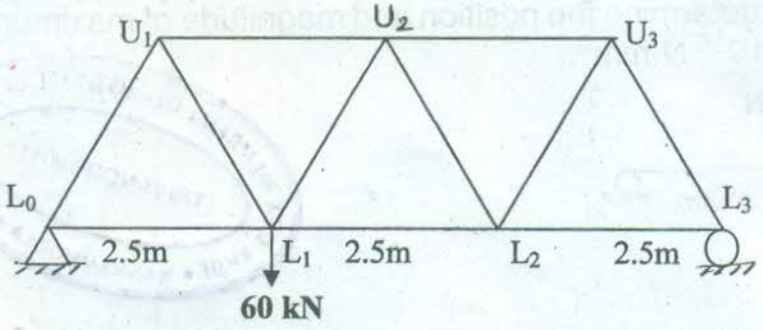

Fig. 3

Module – III

10. A hollow cast iron column whose outside diameter is 200 mm and has thickness 20 mm is 4.5 m long and fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.5. Find the ratio of Euler's to Rankine's loads. Take E = 80 kN/mm^2. Rankine's constant 1/1600 and yield stress of 550 N/mm^2.

OR

11. A three hinged parabolic arch of 30 m span with a central rise of 6 m, carries loads of 200 and 300 kN at horizontal distances of 5 and 10 metres respectively from the ends. Calculate the bending moment, normal thrust and shear force at each quarter point. Determine also the position and magnitude of maximum positive and negative bending moment.

Module – IV

12. The following system of wheel loads crosses a plate girder of 20 m span.

Wheel load (kN) :	25	40	40	30
Distance between centres (m) :	2.0	1.5	1.5	

Determine the maximum value of the shear force at the mid point of span. Find the equivalent uniformly distributed load which could produce the same maximum bending moment at mid span.

OR

13. Using the method of tension coefficients, analyse the space truss shown in Fig. 4 and find the forces in the members of the truss.

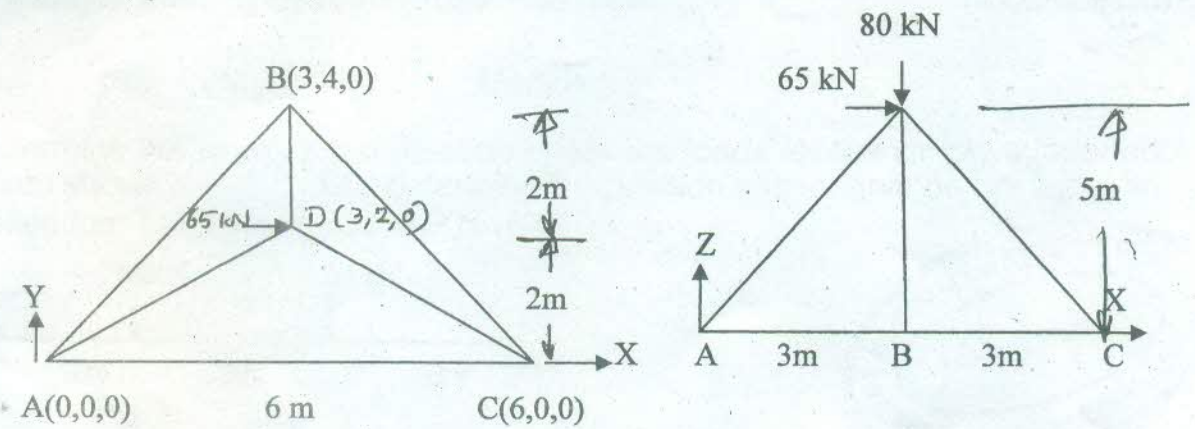

Fig. 4