Fourth Semester B.Tech (Civil Engg.) Degree Examination

(2013 Scheme)

STRUCTURAL ANALYSIS – I

Time: 3 Hrs. Max. Marks: 100

PART A

Answer **ALL** questions (**5** × 4 marks =20 marks)

1) Differentiate between statically determinate and indeterminate structures with examples.
2) Derive the differential equation for the deflection curve of a beam.
3) State and explain the principle of virtual work for deformable bodies.
4) Derive the expression for Euler buckling load for a prismatic column one end hinged and the other end fixed.
5) Define equivalent uniformly distributed loads. A 5m long UDL, of intensity 30kN/m rolls over a girder of span 15m. Find the equivalent uniformly distributed load.

PART B

Answer any **ONE** full question from each module (**4** × 20=80 marks)

MODULE 1

6) Determine the magnitude of maximum deflection for the beam of 5m span shown in Fig.1. E=200 GPa and I=7.5×$10^7$$mm^4$

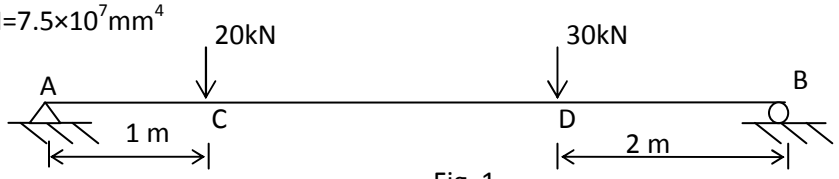
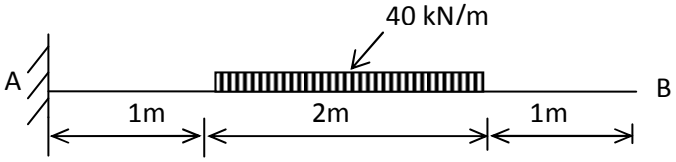


Fig. 1

(20 marks)

OR

7) Using conjugate beam method, determine the slope and deflection at the free end of the cantilever beam loaded with UDL as shown in Fig. 2.



(20 marks)

Fig. 2

MODULE 2

8) Determine the horizontal and vertical deflection at the free end E of the frame shown in Fig. 3 using Castigliano's theorem.

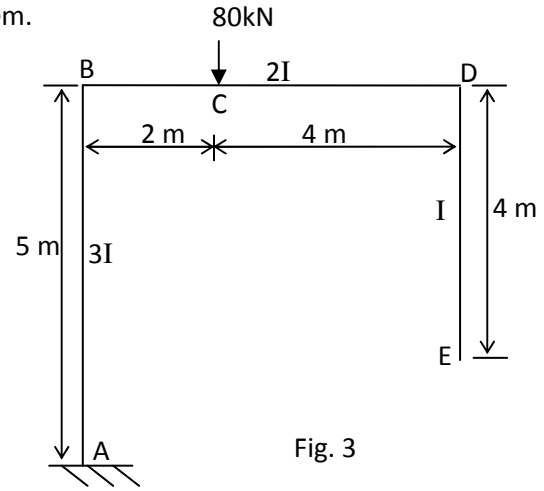


Fig. 3 (20 marks)

OR

9) Determine the vertical and horizontal displacement of joint C of the pin jointed frame shown in Fig. 4 by virtual work method. E=200 MPa, cross sectional area of each member is 200 mm^2.

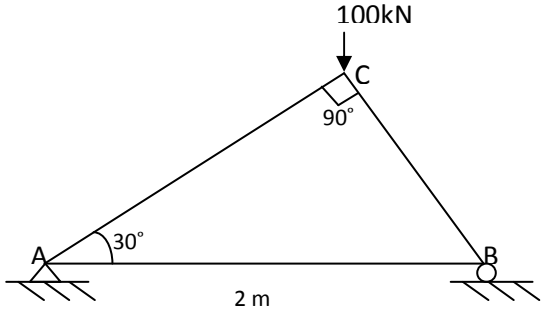


Fig. 4 (20 marks)

MODULE 3

10) Determine the normal thrust, radial shear and bending moment at 6 m from the left support for the parabolic arch of span 30m shown in Fig. 5. (20 marks)

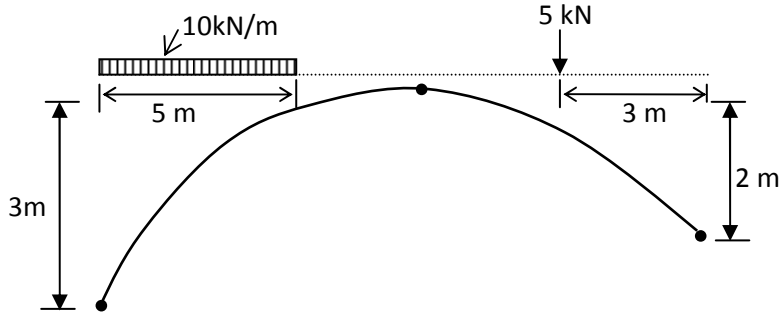


Fig. 5

OR

11) a) What are the limitations of Euler's formula? (5 marks)

b) Determine the cross-section of a cast iron hollow cylindrical column 3m long with both ends fixed subjected to an axial load of 800kN. The ratio of internal to external diameter is 5/8. Assume factor of safety as 4.Take f_c=550N/mm^2, C = 1/1600. (15 marks)

MODULE 4

12) Two point loads 100kN and 50kN spaced 3m apart cross a girder of 10m span, the smaller load leading from left to right. Construct the maximum SF and BM diagrams, stating the position and magnitude of maximum deflection. (20 marks)

OR

13) Fig. 6 shows the plan of a three member structure, hinged to a common point D which is at 4m above ground level. A vertical downward load of 15kN and a horizontal load of 10kN acting towards the left are applied at D. Find the forces in the pin jointed space frame. (20 marks)

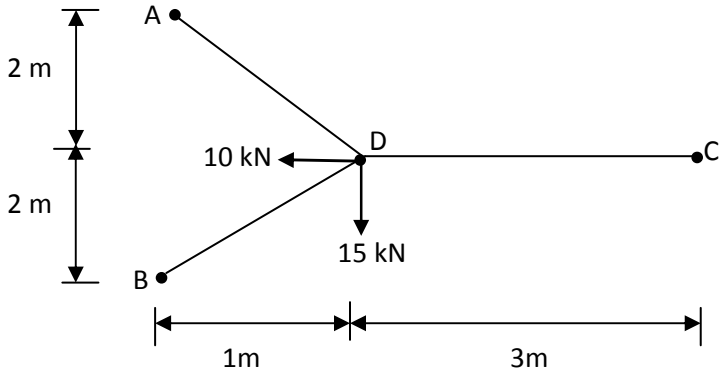


Fig. 6