C 40938 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2013

CE 09 404/PTCE 09 403—STRUCTURAL ANALYSIS—I

(2009 Scheme)

[Regular/Supplementary/Improvement]

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

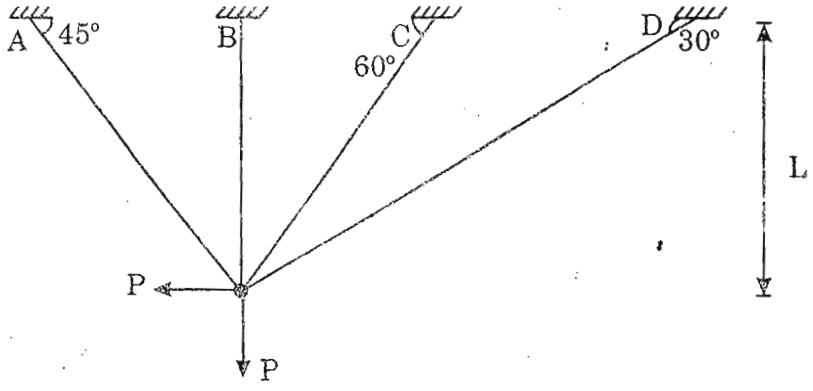
1. State and explain Maxwell's law of reciprocal deflections.
2. State the advantages of Indeterminate structures.
3. Briefly explain externally and internally redundant truss.
4. Explain the concept of influence line.
5. State the difference between three hinged and two hinged arch with respect to structural behaviour.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Derive the relations for strain energy for solid circular shaft of length L and radius R subjected to torque T.
7. Derive the relation for shear forces at support if the support B of a fixed beam AB rotates by an amount θ, and draw the shear force diagram.
8. Analyse the pin jointed frame by the method of consistent deformation and find the forces in the bars. Assume all bars to have same axial rigidity EA.



Turn over

9. Two loads of an electric crane 50 kN each spaced at 4 m. c/c cross a girder of 8 m. span. Find the absolute maximum bending moment in the beam.

10. A uniformly distributed load of intensity 80 kN/m. and 30 m. length crosses a girder of 25 m. span. Find out the maximum SF and BM at a section X–X located at 8 m. from left support.

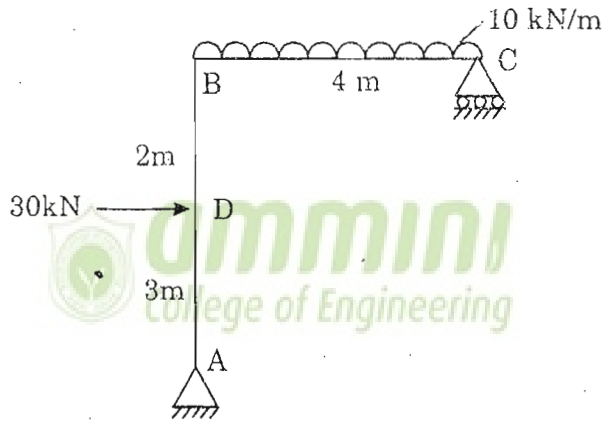
11. A three hinged arch has a span of 24 m. and central rise of 8 m. the body of the arch is fabricated from rolled steel sections. Find the change in central rise due to an increase in temperature of 30°C.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

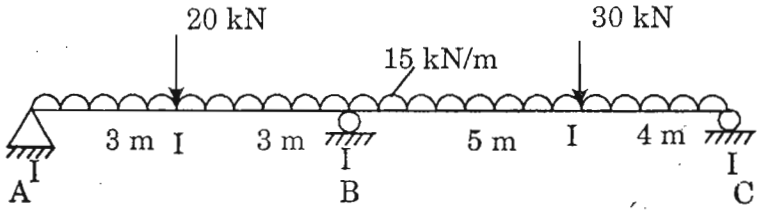
12. (a) Using the method of virtual work, determine the horizontal displacement of a point C of the frame shown in Fig. Take E-2 × 10^5 N/m^2, I- 4 × 10^6 mm^4.



Or

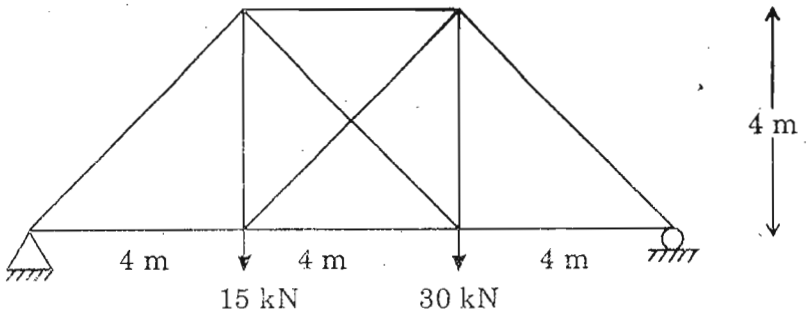
(b) Analyse the fixed beam of span 6 m. loaded by intensity 25 kN/m. by the strain energy method. Take EI as constant. Draw the bending moment diagram.

13. (a) Determine the reaction components and draw the shear force and bending moment diagram for the given beam, if the support B settles by 20 mm. consider E- 2 × 10^6 N/mm^2. and I- 3 × 10^6 mm^4.



Or

(b) Determine the forces in the members of a truss. Area of all members is 500 mm^2.



14. (a) Four equal loads of 80 kN each, equally spaced at 2 m. apart followed by uniformly distributed load of 60 kN/m. run at a distance of 2 m. from the last 80 kN load cross a girder of 20 m. span from right to left. Using influence lines, calculate the SF and BM at a section 8 m. from the left support when the leading 80 kN load is 5 m. from this support.

Or

(b) A curved beam in the form of a quadrant of circle of radius R and having a uniform cross section is in a horizontal plane. It is fixed at A and free at B. It carries a vertical concentrated load W at the free end B. Compute the shear force, bending moment and twisting moment values and sketch the variation. Also determine the vertical deflection of free end B.

15. (a) A three hinged parabolic arch of span 30 m. has its supports at depths of 4 m. and 16 m. below the crown. The arch carries a load of 80 kN at a distance of 5 m. to left of crown and a second load of 100 kN at 10 m. to right of crown. Determine the reactions at supports and bending moments under the loads.

Or

(b) A suspension bridge of 250 m. span has two nos of three hinged stiffening girders supported by cables with a central dip of 25 m. If four point loads of 200 kN each are placed at the centre line of the roadway at 20, 30, 40 and 50 m. from the left hinge, find the shear force and BM in each girder at 62.5 m. from each end. Calculate the maximum tension in the cable also.

(4 × 10 = 40 marks)