C 61570 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
APRIL 2014

(2009 Scheme)

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

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

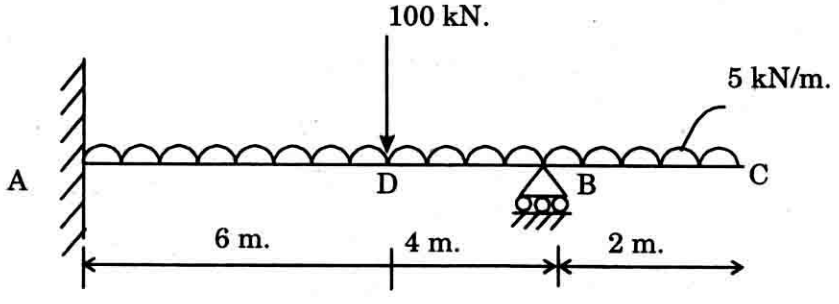
1. State and explain Castigliano's theorem for deflection.
2. Derive the relations for fixed end moments if the support B of a fixed beam AB sinks by an amount δ and draw the bending moment diagram.
3. Explain Equivalent uniformly distributed load.
4. State and explain Muller Breslau principle.
5. State Eddys theorem.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. A steel specimen 1.5 cm^2 in cross section stretches 0.05 mm. over a 5 cm gauge length under an axial load of 30 kN. Calculate the strain energy stored in the specimen at this point. If the load at the elastic limit for specimen is 50 kN, calculate the elongation at the elastic limit and the resilience.
7. Analyse the propped cantilever beam AB with overhang BC loaded as in fig, by the method of consistent deformation, assuming uniform flexural rigidity EI. Draw the shear force and bending moment diagrams.



Turn over

8. Determine the maximum shear developed at section X at a distance of 4 m. from support A of a simple supported beam AB of span 10 m. when series of four concentrated loads of intensity 10 kN. spaced 2 m. apart move from left to right.

9. Two point loads of 10 kN and 5 kN spaced 3 m apart, cross a girder of 10 m. span, the smaller load leading from left to right. Calculate the SF and BM at a section 4 m. from left end support.

10. A parabolic three hinged arch of span L is subjected to a uniformly distributed load of W kN/m over the entire span. Find the horizontal thrust and bending moment at any section X.

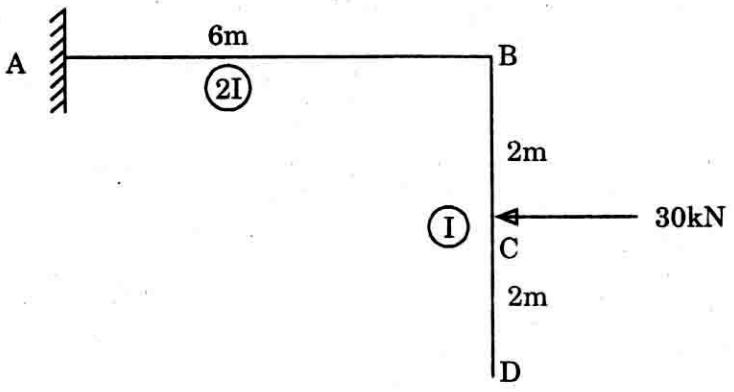
11. A parabolic arch two hinged at the ends has a span of 60 m. and a rise of 12 m. A concentrated load of 10 kN acts at 15 m. from the left hinge. Calculate the horizontal thrust and reactions at support.

(4 × 5 = 20 marks)

Part C

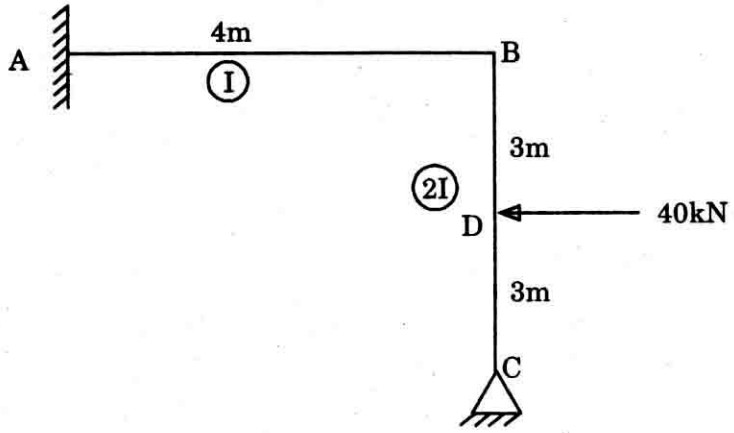
Answer **all** *questions.*

12. (a) Obtain the horizontal deflection at point D for the frame as in fig. Take $I = 2 \times 10^8$ mm^4, $E = 2 \times 10^5$ N/mm^2.

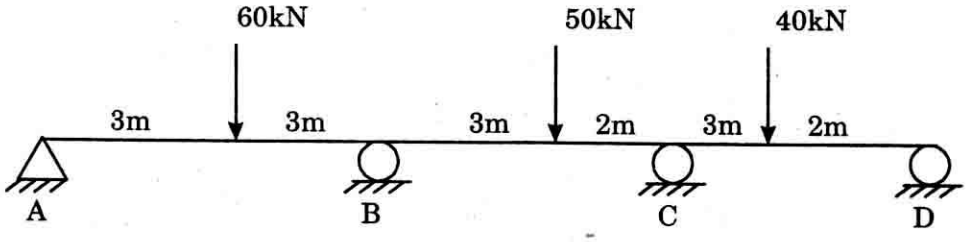


Or

(b) Analyse the structure shown in fig. by strain energy method. Sketch the bending moment diagram.

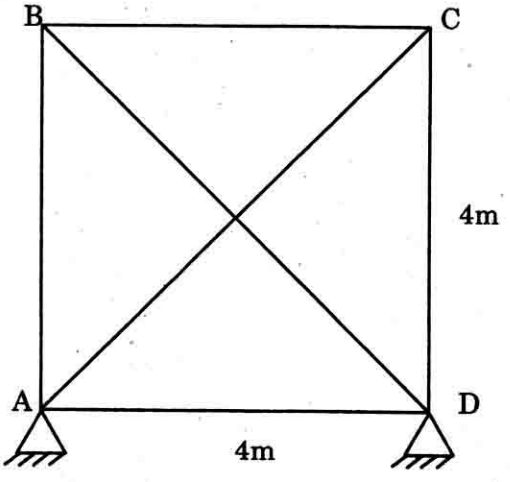


13. (a) Determine the reaction components and draw the shear force and bending moment diagram for the given beam, if the support A, B, C and D settles by 20 mm, 40 mm, 60 mm and 80 mm. consider E – 2×10^6 N/mm^2, and I – 3×10^6 mm^4.



Or

(b) While fabricating the pin jointed frame in fig, the member AC was the last member to be fitted and was found to be 1.5 mm. short of the required length. Find the forces induced in all the members of the frame when the member AC is forced into position. The diagonal members are each 1000 mm^2 in area, while the remaining members are 2000 mm^2 in area. Take E- 2×10^5 N/mm2.



14. (a) A uniform load of 40 kN/m, 6 m long crosses a girder of 25 m. span. Calculate the maximum SF and BM at section 10 m. from left support. Also find the maximum shear and the absolute maximum bending moment in the beam.

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 uniformly distributed load w/m over the entire length of span. 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 circular arch of span 16 m. and rise 4 m. is subjected to two point loads of 100 kN and 80 kN at the left and right quarter span points respectively. Find the reactions at the support. Also find the bending moment, normal thrust and radial shear at section X – X, 6 m. from left support.

Or

(b) A suspension cable of span 100 m. and dip 10 m. carries a uniformly distributed load of 8 kN/m. of horizontal span over the full span. Find the vertical and horizontal forces transmitted to the supporting pylons (i). If the cable is passed over a smooth pulley, (ii). If the cable is clamped to a saddle with rollers on top of piers. The anchor cable makes 30° to the horizontal at the pylons.

(4 × 10 = 40 marks)