G 1526 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2015

Fourth Semester

Branch : Civil Engineering

CE 010 403—MECHANICS OF SOLIDS—II (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. List the available methods to determine the deflection in determinate beams.
2. State Betti's theorem.
3. What is Absolute maximum bending moment.
4. What is theoretical arch ?
5. State maximum principal strain theory.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Determine the rotation and deflection at the free end of a cantilever beam subjected to u.d.l. over and entire span of length '*l*'.
7. Explain Maxwell's theorem of reciprocal deflection.
8. Draw ILD for BM and SF at any point of a Cantilevers beam.
9. Calculate the moment at 5 m. from the left support of a circular arch of span 25 m. with a central rise 5 m, hinged at the crown and springing. It carries a point load of 100 kN at 6 m. from left support.
10. Explain the concept of unsymmetrical bending.

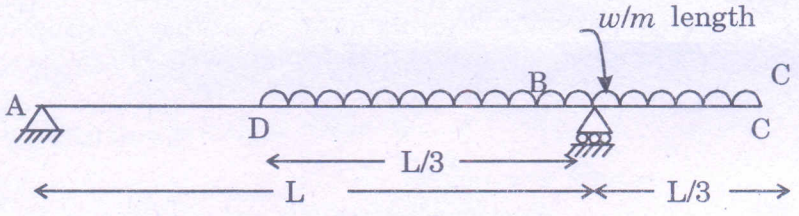
(5 × 5 = 25 marks)

Turn over

Part C

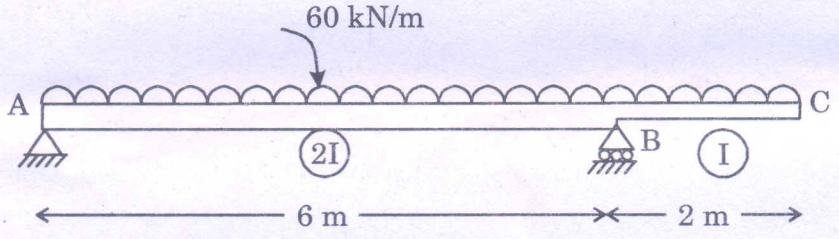
Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Determine the rotation and deflection at the free end in the over handing beam given below using conjugate beam method.



Or

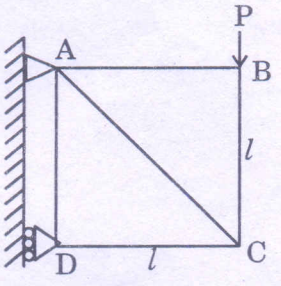
12. Determine the rotation at A and deflection at C in the overhanging beam shown in fig. below :



13. A beam of uniform section is of length 2 l and is simply supported at the ends and by an elastic prob at the centre. If the prob deflects by and times the load it carries and if the beam carries a total u.d.l. of W, find the carried by the prob.

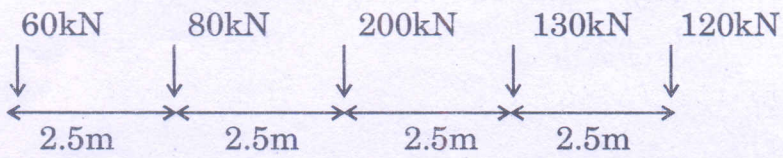
Or

14. Find the strain energy stored by the loaded truss in fig. All members have the same sectional area A and Young Modulus E. Find also the vertical deflection of joint B.



AE is Constant

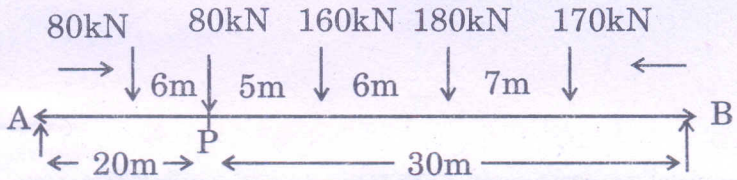
15. A train of 5 wheel loads as in fig. crosses a simply supported beam of span 22.5 m. :



Calculate the maximum positive and negative shear force values of the Centre of the span, and the absolute maximum bending moment anywhere in the span.

Or

16. For the span shown in the sketch below, obtain the bending moment at a section p, 20 m. from A due to loads as shown below :



Also determine the position of the leads for maximum bending moment of section P and the value of maximum moment.

17. The Cables of suspension bridge have a span of 60 m. and a central dip of 7.5 m. Each cable is stiffened by a girder hinged at the ends and also at the middle so as to retain a parabolic shape for the Cables. The girder is subjected to a dead load of 10 kN/m. and a live load of 20 kN/m, 15 m. long. Find the maximum tension in the Cable when the leading edge of the live load is just at the centre of the girder. Draw also SF and BM diagrams for the girder.

Or

18. A three hinged circular arch hinged at the springing and crown points has a span of 40 m. and a central rise of 8 m. It carries a u.d.l. of 20 kN/m. over the left half of the span together with a concentrated load of 100 kN at the right quarter span point. Find the reaction at the supports, normal thrust and shear at a section 10 m. from the left support.

19. A bending moment M applied to a solid round shaft causes a maximum direct stress f at elastic failure. Determine the numerical relation between M and a twisting moment T which acting alone on the shaft civil produce elastic failure, according to following theories of failure :

    (a) Maximum principal stress theory.

    (b) Maximum principal strain theory.

    (c) Maximum strain energy theory.

    (d) Maximum shear stress theory. Take Poisson's ratio = 0.30.

Or

20. (a) Briefly explain Maximum principal stress theory. (5 marks)

    (b) Explain using the concept of product of inertia, bending stress at a given point in the section due to a given bending moment. (7 marks)

(5 × 12 = 60 marks)