Question Paper Code : R 3612

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Third Semester

Chemical Engineering

CH 235 — MECHANICS OF SOLIDS

(Common to Leather Technology and Textile Technology)

(Regulation 2001)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define stiffness of materials.

2. State Hooke's law.

3. What are the important points should be consider for drawing shear force and bending moment diagrams?

4. What do you mean by over hanging beam and their applications?

5. What is Macaulay's method? Where is it used?

6. Mention the application of conjugate beam method.

7. What do you mean by pure bending? What are the assumptions made in the theory of simple bending?

8. How will you draw the shear stress distribution for composite section?

9. Define helical spring. Name the two important types of helical springs.

10. What are the assumptions made in Euler's column theory?

11. (a) The ultimate stress for a hollow steel column which carries an axial load of 2 MN is 500 N/mm². If the external diameter of the column is 250 mm, determine the internal diameter. Take the factor of safety as 4.0.

Or

(b) A steel rod of 20 mm diameter passes centrally through a copper tube 40mm external diameter and 30mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projected parts of the rod. If the temperature of the assembly is raised by 50°C, calculate the stresses developed in copper and steel. Take E for steel and copper as 200 GN/m² and 100 GN/m² and α for steel and copper as 12×10^{-6} per °C and 15×10^{-6} per °C.

12. (a) A cantilever beam length of 2 m carries a uniformly distributed load 1.5 kN/m run over the whole length and a point load of 2 kN at a distance of 0.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever beam.

Or

(b) A simply supported beam of length 5 m carries a uniformly increasing load of 800 N/m run at one end to 1600 N/m run at the other end. Draw the shear force and bending moment diagrams for the beam. Also calculate the position and magnitude of maximum bending moment.

13. (a) A beam of length 5 m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm² and central deflection is not to exceed 1 cm. Take E for beam material = 1×10^4 N/mm².

Or

(b) A horizontal beam AB is simply supported at A and B, 6 m apart. The beam is subjected to a clockwise couple of 300 kNm at a distance of 4 m from the left end. Determine deflection at the point where couple is acting. Take E = 2×10^5 N/mm² and I = 2×10^8 mm⁴.

14. (a) A timber beam of rectangular section is to support a load of 20 kN uniformly distributed over a span of 3.6 m when beam is simply supported. If the depth of section is to be twice the breadth and the stress in the timber is not to exceed 7 N/mm². Find the dimensions of the cross section.

Or

15. (a) A hollow shaft having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in material, if the material to be used is also same.

Or

(b) Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and other hinged) of 15 cm external diameter, 10 cm internal diameter and 10 m in length. Use Euler's formula with a factor of safety of 5 and E = 95kN/mm².