Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20258

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third/Fourth Semester

Civil Engineering

CE 6306 — STRENGTH OF MATERIALS

(Common to Mechanical Engineering (Sandwich)/Agricultural Engineering/ Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Materials Sciences and Engineering/ Mechanical Engineering/Mechanical and Automation Engineering/ Mechatronics Engineering/Production Engineering)

(Regulations 2013)

(Also Common to PTCE 6306 – Strength of Materials for B.E. (Part-Time) – Second Semester – Mechanical Engineering (Regulations – 2014))

Time : Three hours Maximum : 100 marks

Assume suitable data if found necessary.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Poisson's ratio.

2. Write an expression of volumetric strain for a rectangular bar subjected to an axial load P.

3. What do you mean by the point of contra flexure?

4. Enlist the assumptions in the theory of simple bending.

5. What is called twisting moment?

6. Give any two functions of spring.

7. A cantilever beam is subjected to a point load W at the free end. What is the slope and deflection at the free end?

8. State the Maxwell's reciprocal theorem.

9. Distinguish between thin and thick cylinders.

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

PART B — (5 × 13 = 65 marks)

11. (a) A reinforced short concrete column 250 mm × 250 mm in section is reinforced with 8 steel bars. The total area of steel bars is 2500 mm². The column carries a load of 390 kN. If the modulus of elasticity for steel is 15 times that of concrete, find the stresses in concrete and steel.

Or

(b) The stresses at a point in a bar are 200 N/mm² (tensile) and 100 N/mm² (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major stress. Also determine the maximum intensity of shear stress in the material at the point.

12. (a) Draw a shear force and bending moment diagram for a simply supported beam of length 9 m and carrying a uniformly distributed load of 10 kN/m for a distance of 6 m from the left end. Also calculate the maximum B.M. on the section.

Or

(b) A simply supported wooden beam of span 1.3 m having a cross section 150 mm wide by 250 mm deep carries a point load W at the center. The permissible stress are 7 N/mm² in bending 1 N/mm² in shearing. Calculate the safe load W.

13. (a) A hollow shaft is to transmit 300 kW power at 80 r.p.m. If the shear stress is not to exceed 60 N/mm² and the internal diameter is 0.6 of the external diameter, find the external and internal diameters assuming that the maximum torque is 1.4 times the mean.

Or

(b) The stiffness of a closed-coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire of the spring is 125 N/mm². The solid length of the spring (when the coils are touching) is given as 5 cm. Find :

(i) diameter of wire

(ii) mean diameter of the coils and

(iii) number of coils required. Take C = 4.5 × 10⁴ N/mm².

14. (a) A beam of length 5 m and of uniform rectangular section is supported at its ends and carries uniformly distributed load over the entire length. Calculate the depth of the section if the maximum permissible bending stress is 8 N/mm² and the central deflection is not to exceed 10 mm.

Or

(b) Derive the equation for slope and deflection of a simply supported beam of length 'L' carrying point load W' at the centre by Mohr's theorem.

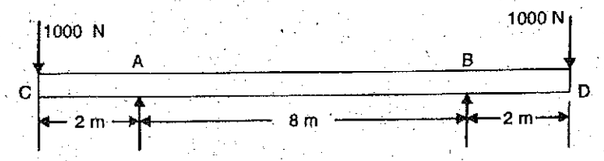
15. (a) A boiler shell is to be made of 15 mm thick plate having a limiting tensile stress of 120 N/mm². If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively determine : The maximum permissible diameter of the shell for an internal pressure of 2 N/mm².

Or

(b) A thin cylinder shell with following dimensions is filled with a liquid at atmospheric pressure : Length = 1.2 m. external diameter = 20 cm, thickness of metal = 8 mm. Find the value of pressure exerted by the liquid on the walls of the cylinder and the hoop stress induced if an additional volume of 25 cm³ of liquid is pumped into the cylinder. Take E = 2.1 × 10⁵ N/mm² and Poisson's ratio = 0.33.

PART C — (1 × 15 = 15 marks)

16. (a) A beam of length 12 m is simply supported at two supports which are 8 m apart, with an overhang of 2 m on each side as shown in Fig. The beam carries a concentrated load of 100 N at each end. Draw S.F. and B.M. diagrams.



Or

(b) A cantilever of length 3 m carries a uniformly distributed load of 80 kN/m over the entire length. If E = 2 × 10⁸ kN/m² and I = 10⁸ mm⁴, find the slope and deflection at the free end using conjugate beam method.