

OR

- 4 a. State the assumptions made in 'Euler-Bernoulli' beam theory. (02 Marks)
 b. Derive the bending equation of the beam with usual notations. (08 Marks)
 c. Two wooden planks 150mm × 50mm each are connected to form a T-section of a beam. If a moment of 6.4kN-m is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the bending stresses of both the extreme fibres of the cross-section. (10 Marks)

Module-3

- 5 a. Explain the following briefly:
 i) Macaulay's method. (10 Marks)
 ii) Double integration method. (10 Marks)
 b. Derive an expression for deflection and slope of a cantilever beam of length L, carrying a point load of W at the free end by double integration method. (10 Marks)

OR

- 6 a. Define the following terms:
 i) Torsional rigidity (04 Marks)
 ii) Polar modulus. (08 Marks)
 b. Derive the torsional equation of a solid shaft with usual notations. (08 Marks)
 c. Determine the diameter of a solid steel shaft which will transmit 90kN of 160rpm. Also determine the length of the shaft if the angle of twist must not exceed 1° over the entire length. The maximum shear stress induced is limited to 60N/mm². Take modulus of rigidity as 8×10^4 N/mm². (08 Marks)

Module-4

- 7 a. Write short notes on the following:
 i) Principle of virtual work. (10 Marks)
 ii) Principle of complementary virtual work. (10 Marks)
 b. What is 'Principle of minimum total potential energy'? Explain. (10 Marks)

OR

- 8 a. Explain the principle of virtual work for a particle connected to an elastic spring. (10 Marks)
 b. State 'Saint-Venant's principle'. Explain with an example. (10 Marks)

Module-5

- 9 a. Define 'Creep'. (02 Marks)
 b. Explain the three stages of creep using a creep curve for metals. (08 Marks)
 c. Explain the three modes of crack surface displacement with neat sketches. (10 Marks)

OR

- 10 a. Define the term 'Fatigue'. (02 Marks)
 b. List and explain the factors that affect the fatigue life. (08 Marks)
 c. What is 'S-N curve' in fatigue? Explain its significance in predicting fatigue failure of materials. (10 Marks)
