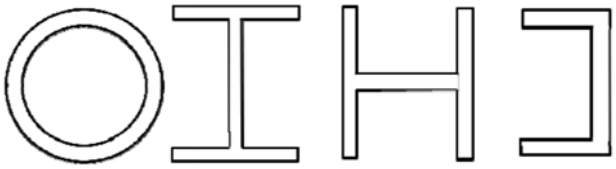
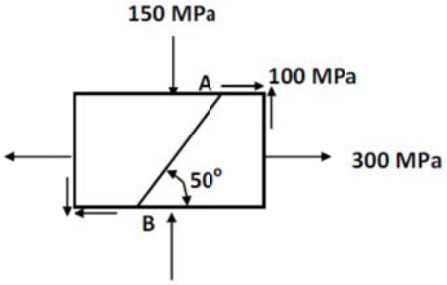
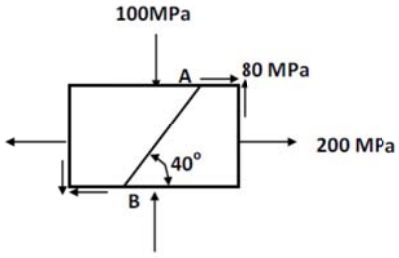
Gujarat University

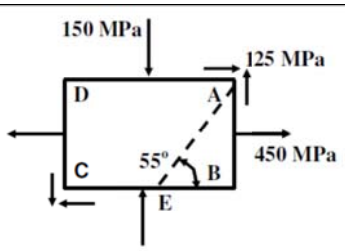
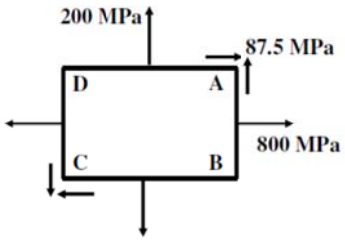
BE Semester- first year (All) Question Bank

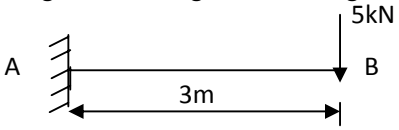
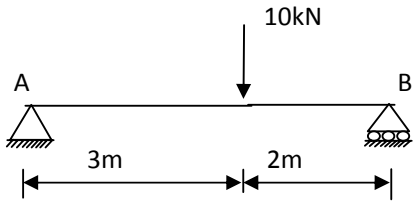
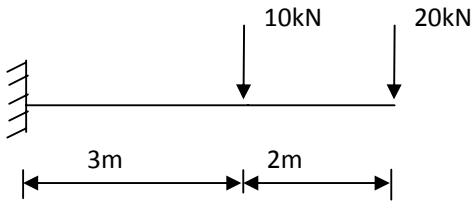
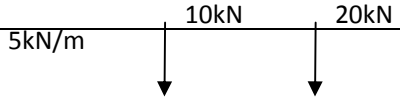
Strength of Materials

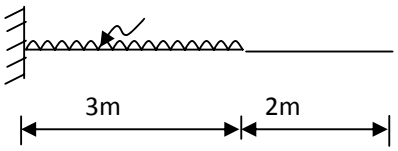
All questions carry equal marks(10 marks)

Sr. no	Question
Q.1	Give the examples of the Physical, Chemical, Mechanical, Thermal, Electrical properties of the engineering materials
Q.2	Define the following terms (any five) a. Elasticity b. Plasticity c. Hardness d. Toughness e. Brittleness f. Malleability
Q.3	Explain the Compressive strength test procedure either on Timber or Mild Steel. Also comment on the failure mode of the material
Q.4	List the various tests carried out to measure the Toughness of material. Explain any one test method in detail
Q.5	Define the following terms (any five) a. Bending stress in a beam b. Neutral axis c. Moment of resistance d. Flexural Rigidity e. Modulus of Rupture f. Radius of Curvature g. Neutral Layer
Q.6	Prove with usual notations theory of Simple bending $M/I = f/y = E/R$
Q.7	Explain what do you mean by Pure Bending. Also state the assumptions made in the theory of Pure bending
Q.8	What do you mean by Shear Stresses in beams. Show that for a rectangular section the maximum shear stress is 1.5 times the average shear stress
Q.9	Prove that under axial loading, the maximum shear stress on a incline plane is half that of the Normal stress
Q.10	Define the following terms: (any five) a. Principal Plane b. Principal Stress c. Angle of Obliquity d. Resultant Stress e. Mohr's circle of stress
Q.11	A simply supported beam of span 8.0 m carries a point load of 50 kN at the centre of the span. Calculate the section modulus required if the bending stress is not to exceed 150 MPa.
Q.12	Draw the Shear stress distribution diagram for the sections below:

	
Q.13	A beam is of rectangular section with width 200 mm and depth 450 mm. The beam is simply supported over a span of 4.0 m and carries audl of 8kN/m over the entire span. Determine the Maximum tensile and compressive stress
Q.14	Find out the maximum bending stress at top and bottom of the beam if the maximum bending moment M = 102.856 kNm. The dimensions of the beam are Width of the beam is 200 mm. and the depth of the beam is 300 mm.
Q.15	Find out the section Modulus for the following section: a. Rectangular section : Width 'b' and Depth 'd'; I = $bd^3/12$ b. Circular section: Diameter 'D'; I = ∏/64 D^4 c. Triangular section : Base 'b' and height 'h'; I = $bh^3/36$
Q.16	For the element shown in the figure, find the normal stress, tangential stress and resultant stress on the plane AB. Also, find principal stresses and principal planes. Use any method. 
Q.17	For the element shown in the figure, find the normal stress, tangential stress and resultant stress on the plane AB. Also, find principal stresses and principal planes. Use any method. 
Q.18	For the infinitesimal element shown in the ***figure below***, find the normal stress, tangential stress and resultant stress along with its angle of obliquity on the plane AE. Use any method.

	
Q.19	For the infinitesimal element shown in the ***figure below***, find the principal stresses and their planes. Use Mohr's circle method 
Q.20	Write short notes on the following: (any two) a. Beams of Uniform Strength b. Built up section and composite beam sections c. Tensile tests on Mild steel d. Stress – Strain curve of Mild steel e. Modes of fracture
Q.21	Define and explain following terms.(Any Five) a. Stress b. strain c. Modulus of elasticity d. Temperature strain e. Factor of safety f. Lateral strain
Q.22	Define and explain following terms.(Any Five) a. Lateral stress b. Working stress c. Modulus of rigidity d. Poission ratio e. Bulk modulus f. Shear stress
Q.23	Do as Directed. a. Derive a formula for stresses in uniformly tapering bar. b. Establish a relation between Young 's modulus, modulus of rigidity & Poission ratio.
Q.24	A rod 1500 mm long and of dia 20 mm is subjected to an axial pull of 20 kN. If the modulus of elasticity of the material of the rod is 2 x10^5 N/mm^2. Determine (i) the stress (ii)strain (iii)the elongation of the rod.
Q.25	A load of 2 kN is applied on a short concrete column 500 x 500 mm. The column is

	reinforces with four steel bars of 10 mm diameter, once in each corner. Find stress in the concrete & steel bars. Take Es=2.1 x10^5 N/mm^2, Ec=1.4 x10^5 N/mm^2.
Q.26	A circular bar fixed at both ends and diameter 150 mm is heated through 80 ^oC. Find the maximum stress induced in the bar. Take E= 200 GPa and α= 12x 10^{-6} ^oC
Q.27	A square rod 1 m long and of 10 mm *10 mm in cross section is subjected to an axial pull of 50 kN. Take E=2.1 x10^5 N/mm^2 Determine (i) stress (ii)strain (iii)Change in length of the rod.
Q.28	Define: (i) Shear force (ii) Bending moment (iii) Point of contra flexure (iv) Critical point
Q.29	Do as directed: a. Derive relation between shear force and bending moment b. Differentiate between: • Bending and torsion • Shear force and bending moment
Q.30	Differentiate between: Stress and strain Bending and torsion Shear force and bending moment
Q.31	Draw Shear Force and Bending moment diagram of a 4 m long cantilever beam subjected to U.D.L. of 10 kN/m through out the span.
Q.32	Draw shear force diagram, bending moment diagram for the given beam. 
Q.33	Draw shear force diagram, bending moment diagram for the given beam. 
Q.34	Draw shear force diagram, bending moment diagram for the given beam. 
Q.35	Draw shear force diagram, bending moment diagram for a beam simply supported and carries an udl of 25kN/m over the span of 3 m.
Q.36	Draw shear force diagram, bending moment diagram for the given beam. 

	
Q.37	Do as directed. a. What do you mean by torsion. Explain with suitable example. Write the equation of torsion. b. Give assumptions made in theory of torsion
Q.38	Prove with usual notations, theory of torsion.
Q.39	A solid circular shaft 2 m long and 100 mm diameter is required to transmit 2000 kW power when running at a speed of 300 rpm. Find maximum shear stress.
Q.40	A hollow circular shaft 2 m long is required to transmit 1000 kW power when running at a speed of 300 rpm. If the shaft is 150 mm and the inner diameter is 120 mm, find maximum shear stress.