

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-IV Remedial Examination Nov/ Dec. 2010****Subject code: 140201****Subject Name: Mechanics of Deformable Bodies****Date: 03 /12 /2010****Time: 03.00 pm – 05.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** A rectangular steel bar has cross section of 25mm X 50mm. The steel bar is loaded by an axial compressive load. Both the ends of bar are hinged. The yield stress of material is 250 MPa and the modulus of elasticity is 2.0×10^5 MPa. Determine the limiting length at which the Euler's equation can be applied. Also determine the limiting load that can be applied on the bar if the length of bar is (i) 0.5m (ii) 1.5m. **07**

- (b)** Distinguish between arch, cable, net, membrane, framed and grid structures. **07**

- Q.2 (a)** Determine the maximum deflection of the beam loaded as shown in fig.-1. Take $EI = 1 \times 10^{13} \text{ N-mm}^2$. **07**

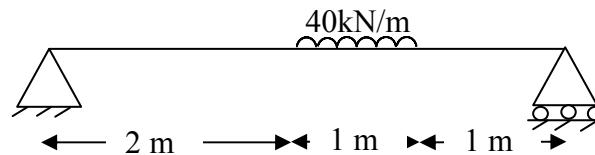


fig.-1

- (b)** Determine the stresses and draw the stress distribution of hollow circular section subjected to a compressive load $W = 80 \text{ kN}$ as shown in fig.-2. **07**

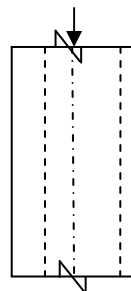
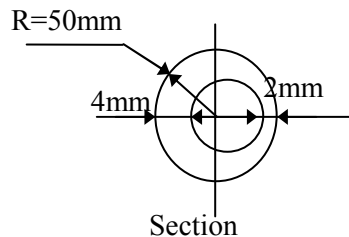


fig -2

Elevation

OR

- (b)** A cantilever truss of 3m span is loaded as shown in fig.-3. Determine the deflection at joint B. **07**

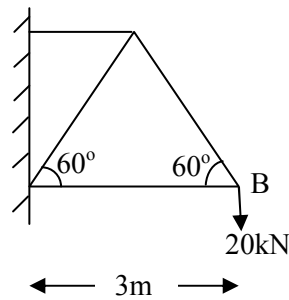


fig.-3

- Q.3** (a) A masonry chimney; 18.0m high has a hollow circular section having 3.0m external diameter and 2.0m internal diameter. The density of masonry is 20kN/m^3 . If the chimney is subjected to a wind pressure of 1.5kPa , determine the maximum stresses and draw the stress distribution at the base of chimney. **07**
- (b) Find the power transmitted by a belt running over a pulley of 1.0 m dia. at 200rpm. The co-efficient of friction between pulley and belt is 0.15 and the angle of lap is 180° . The max. tension in the belt is 3.5kN . **07**

OR

- Q.3** (a) Calculate the dia. of shaft required to transmit power of 100kW at 150rpm. The max. shear stress is limited to 80MPa and the angle of twist is not to exceed 2° for 1m length of shaft. Take $G = 0.8 \times 10^5 \text{ MPa}$. **10**
- (b) What is core of section? Determine the core of circular section of dia. D **04**

- Q.4**
- (a)** Design a suitable welded end connection of an angle ISA100x100x8 with 10mm thick gusset plate to carry an axial load of 100kN. **07**
- (b)** A beam of square section with 100mm side is subjected to a bending moment of 1kN.m; the trace of plane of loading is inclined at 45° with horizontal axis. Determine the bending stresses at corners. **07**

OR

- Q.4** (a) Two plates 12mm thick are joined by doubly bolted lap joint design a joint take $f_y=250$ MPa for the plate. 07
- (b) Derive the general formula for bending moment at section of a circular beam, loaded symmetrically by uniformly distributed load and supported by end supports placed symmetrically. 07

- Q.5** (a) Determine the principal moment of inertia of an equal angel section ISA 100x100x10mm. 07
- (b) A beam geometry as shown in fig.-4 is of a quarter circle with radius of circle R. The beam is fixed at one end and free at the other end. It carries a point load W at free end. Draw shear force, bending moment diagram and twisting moment diagrams for the beam. 07

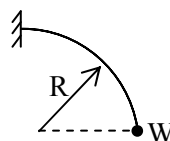


fig.-4

OR

- Q.5 (a)** A hook has a radius of curvature r (at center of section) equal to 100mm. It is made up of a circular cross section of 100mm dia. as shown in fig.-5. The line of load passes through the straight portion is 50mm away from center of curvature determine the extreme fiber stresses setup in the critical section at A of the hook when a load of 100kN is suspended through it. **10**

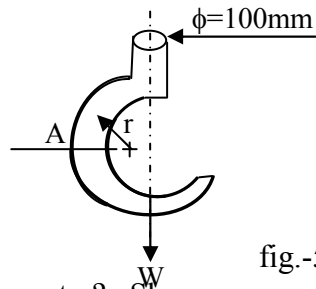


fig.-5

- (b)** What is shear center? Show approximate location of shear center of rectangular, channel, and angle section. **04**
