



Topic : Problems On Torsion

1. Derive the relation for circular shaft when subjected to torsion as given below.

$$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$$

2. Find an expression strain stored in a solid shaft and also for hollow shaft when subjected to torsion.
3. A solid circular shaft is to transmit 375kW at 150 r.p.m a) find the diameter of shaft if the shear stress is not exceed 65 N/mm² b) what percent saving in weight would be obtained if the shaft is replaced by hollow shaft whose internal is equal to 2/3 of external diameter, the length, the material and maximum shear stress is being same.
4. Two shaft are connected end to end by means of a flanged coupling in which there are 12 bolts, the pitch circle diameter is being 30 cm. the maximum shear stress is limited to 60 N/mm² in the shafts and 25 N/mm² in the bolts. If one shaft is solid of 6cm diameter and other is hollow of 12 cm external diameter, calculate the internal diameter of the hollow shaft and the bolt diameter so that both the shaft and the coupling are all equally strong in torsion.
5. A hollow shaft of 1.5 m long has external dia 60mm. it has 30 mm internal diameter for a part of length and for 40 mm internal diameter of rest of length. If the maxi shear stress in it is not to exceed 85 N/mm², determine the maximum horse power transmitted by it at a speed 350 r.p.m. if the twist produced in the two portion of shaft are equal find the lengths of the two portions.
6. A compound shaft is made by mounting a gunmetal sleeve on a steel shaft. The shaft is subjected to a torque in such a way that the torque on the sleeve is twice that on the shaft. Determine the ratio of external diameter of the sleeve to that of the shaft. What will be the torque transmitted by the compound shaft if the steel shaft diameter is 56 mm and the limiting value of shear stresses in gun metal and steel sleeve are 50MPa and 85 MPa respectively. $C_{\text{steel}} = 2.4 C_{\text{gunmetal}}$.