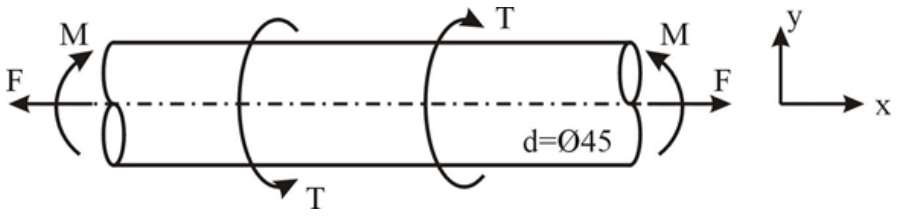
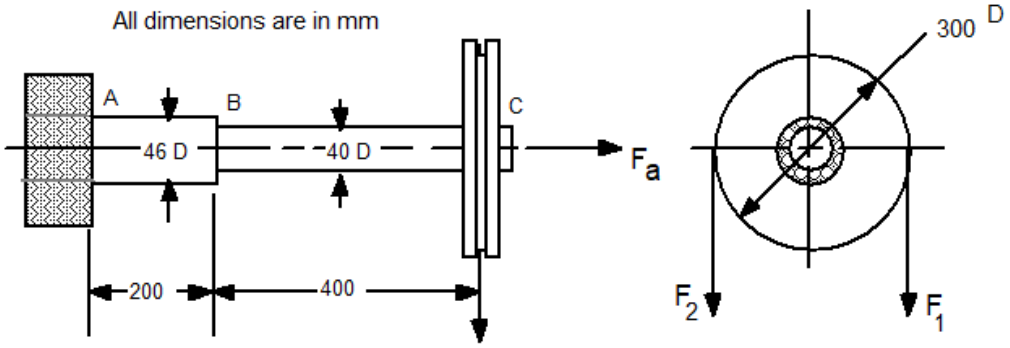
TUTORIAL – STATIC DESIGN

Question 1: Using the maximum shear stress (MNST) and maximum normal stress theory (MSST), find the minimum yield strength to be used for the beam shown in the figure. Choose an appropriate material accordingly.

T=300 N.m, M=250 N.m, F=800 N. (Take the safety factor as 2.5).



Question 2: The shaft shown in the figure is fixed at the left end and supports a pulley at the right end. The pulley rotates and the tensions in the belt of pulley are F_1 = 2700 N and F_2 = 1400 N. Additionally, an axial load of 15 kN is applied at the right end. Shaft material is steel with Syt=550 Mpa and Sut=690 Mpa. Determine the factor of safety based on distortion energy theory of failure.



Question 3: Consider the following load raising system. Wire rope is rounded on the drum from right to left and from left to right. The shaft is made of steel with S_y=680 MPa, S_{ut}=1000 MPa and E=207 GPa.

(a) Calculate the power of the motor if the load is to be raised at a constant speed of 0.5 m/s.

(b) Determining the critical section, determine factor of safety by using,

- Maximum shear stress theory of failure (MSST)
- Distortion energy theory of failure (DET).

