ASSIGNMENT # 2

Due date 09/05/2020

1. The rim of a rotating wheel is 1.2 m in diameter. Determine the limiting speed of the wheel and the change in diameter if the maximum stress is not to exceed 130MPa. Density of the material is 7700 kg/m3 and E = 205GPa. Neglect the effect spokes of the wheel. Treat the rim to be thin.

2. A solid steel propeller shaft, 60 cm in diameter, is rotating at a speed of 300 rpm. If the shaft is constrained at its ends so that it cannot expand or contract longitudinally, calculate the total longitudinal thrust over a cross section due to rotational stresses. Poisson’s ratio may be taken as 0.3. The density of steel may be taken as 0.07938 N/cm3

3. A solid disc of uniform thickness and having a diameter of 400mm rotates at 7500 rpm. Determine the radial and the hoop stresses at radii of 0, 50mm, 100mm, 150mm and 200mm.Density of the material is 7500 kg/m3. What are the maximum values of the radial, hoop and shear stresses?

4. A solid cylinder with a 400mm diameter rotates at 2100 rpm. Plot the variation of radial and hoop stress in the cylinder. What is the maximum hoop stress? Density of the cylinder material is 7700 kg/m3. Poisson’s ratio is 0.3.

5. A steam turbine rotor designed for uniform strength of 70 MPa rotates at 3600 rpm. The thickness of the rotor at the centre is 20 mm. Determine the thickness of the rotor at a radius of 400mm.Density of the material of the rotor is 7700 kg/m3.

6. A thin uniform steel disc of 200 mm diameter having a central hole of 40 mm diameter is rotating at 8000 rpm. Determine the collapse speed taking the yield stress to be 270 MPa. Density of the steel is 7700 kg/m3.

7. A flywheel with a moment of inertia of 300 kg.m2. If the maximum stress is not to exceed 6 MPa. Find the thickness of the rim. Take the width of the rim as 150 mm and the density of the material 7400 kg/m3.Neglect the effect of inertia of spokes.