B.E 5th Semester Mechanical Engineering
Dynamics of Machinery

Rotating unbalance

1	A shaft of 50 mm diameter and 3 m length has a mass of 10 kg per meter length. It is simply supported at the ends and carries three masses of 70 kg, 90 kg and 50 kg at 1 m, 2 m and 2.5 m respectively from the left support. Find the natural frequency of transverse vibrations by using Dunkerley's method. Consider value of E=200 GPa.
2	A horizontal shaft of 10 mm diameter is simply supported at both ends by bearings. A rotor of mass 5 Kg is attached at middle of the horizontal shaft. The span between two bearing is 500 mm. The center gravity of the rotor is 2.5 mm offset from the geometric center of the rotor. The equivalent viscous damping at the center of the rotor-shaft may be taken as 52 Ns/m. Find the deflection of the shaft and critical speed of the shaft.
3	A shaft 100 mm diameter is simply supported in two bearings 4 m apart carrying three discs having masses 125 kg, 200 kg and 100 kg situated at 1.5 m, 2 m and 3 m from one of the bearings respectively. Determine the frequency of transverse vibration of the beam by Dunkerley's method. Neglect mass of the beam. Assume E = 2 x 105 MPa.
4	A rotor has a mass of 12 kg mounted midway on a 24 mm diameter horizontal shaft supported at the ends by two bearings which are 1 m apart. The shaft rotates at 2400 rpm. If the centre of mass m of the rotor is 0.11 mm away from geometric centre of the rotor due to certain manufacturing defects, find the natural frequency, amplitude of the steady state vibration and dynamic force transmitted to the bearings. The shaft is assumed to be simply supported. Take modulus of elasticity as 200 GPa
5	What do you understand about critical speed of shaft?
6	What is secondary critical speed of shaft? Derive equation.