Lukhdhirji Engineering College, Morbi

Department of Mechanical Engineering

Assignment 4- Gyroscope (CO3)

Subject: DYNAMICS OF MACHINERY (3151911) **Semester : 5th**

Year : 2022-23

1. Define: (a) Plane of spinning and plane of precession
2. Explain (a) steering (b) pitching and (c) rolling in context of a naval ship
3. An aeroplane runs at 600 km / h. The rotor of the engine weighs 4000 N with radius of gyration of 1 metre. The speed of rotor is 3000 r.p.m. in anticlockwise direction when seen from rear side of the aeroplane. If the plane takes a loop upwards in a curve of 100 metres radius, find : 1. gyroscopic couple developed; and 2. effect of reaction gyroscopic couple developed on the body of aeroplane
4. Define: Angle of heel

   Find the angle of inclination with respect to the vertical of a two wheeler negotiating a turn. Given: combined mass of the vehicle with its rider 250 kg ; moment of inertia of the engine flywheel 0.3 kg-m^2 ; moment of inertia of each road wheel 1 kg-m^2 ; speed of engine flywheel 5 times that of road wheels and in the same direction ; height of centre of gravity of rider with vehicle 0.6 m ; two wheeler speed 90 km/h ; wheel radius 300 mm ; radius of turn 50 m.
5. A four wheeled motor car of mass 2000 kg has a wheel base 2.5 m, track width 1.5 m and height of centre of gravity 500 mm above the ground level and lies at 1 metre from the front axle. Each wheel has an effective diameter of 0.8 m and a moment of inertia of 0.8 kg-m^2. The drive shaft, engine flywheel and transmission are rotating at 4 times the speed of road wheel, in a clockwise direction when viewed from the front, and is equivalent to a mass of 75 kg having a radius of gyration of 100 mm. If the car is taking a right turn of 60 m radius at 60 km/h, find the load on each wheel.