Code: 9A03502

R09

B.Tech III Year I Semester (R09) Regular & Supplementary Examinations December 2014

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 An aeroplane makes a complete half circle of 60 m radius towards left when flying at 250 km/hr. The rotary engine and propeller of the plane has a mass of 450 kg with a radius of gyration of 300 mm. The engine runs at 2400 rpm clockwise when viewed from the rear. Find the gyroscopic effect on the aircraft.

2 A pivot bearing of a shaft consists of a frustrum of a cone. The diameters of the frustrum are 200 mm and 400 mm and its semi cone angle is 60^0. The shaft carries a load of 40 kN and rotates at 240 r.p.m the coefficient of friction is 0.02. Assuming the intensity of pressure to be uniform. Determine: (i) The magnitude of pressure, and (ii) The power lost in friction.

3 A car engine has its rated output of 10 kW. Maximum torque developed is 100 N-m. The clutch used is of single plate type, having two active surfaces. Axial pressure is not to exceed 0.85 bar. External diameter of the friction plate is 1.25 times the internal diameter. Determine the dimension of the friction plate and the axial force exerted by the springs. Assume uniform wear and coefficient of friction as 0.3.

4 A three-cylinder single acting engine has its crank at 120^0. The turning moment diagram for each cycle is a triangle for the power stroke with a maximum torque of 60 N.m at 60^0 after the dead centre of the corresponding crank. There is no torque on the return stroke. The engine runs at 400 rpm. Determine:

(a) The power developed.

b) (The coefficient of fluctuation of speed if the mass of the flywheel is 10 kg and radius of gyration 88 mm.

(c) The coefficient of fluctuation of energy.

(d) The maximum angular acceleration of flywheel.

5 Explain the working of a Hartung governor with a neat sketch.

6 A shaft carries four rotating masses A, B, C and D in this order along its axis. The mass A may be assumed to be concentrated at radius of 18 cm, B of 24 cm, C of 12 cm and D of 15 cm. The masses of B, C and D are 30 kg, 50 kg and 40 kg respectively. The planes containing B and C are 30 cm apart. The angular spacing of the planes containing C and D are 90^0 and 210° respectively relative to B measured in the same plane. If the shaft and masses are to be in complete dynamic balance, find: (i) the mass and angular position of mass A. (ii) the position of the planes A and D.

7 Discuss the unbalanced forces and couples acting in a four cylinder in- line engines and the method of balancing them.

8 A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine:

a) (Damping factor and logarithmic decrement.

(b) Critical damping coefficient.

(c) Natural frequency of damped vibrations.

(d) Ratio of two consecutive amplitudes.

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