Code: 9A03502

R09

B.Tech III Year I Semester (R09) Supplementary Examinations June 2016

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 The turbine rotor of ship is of 2000 kg mass and has a radius of gyration of 0.8 m. Its speed is 2000 rpm. The ship pitches 5^0 above and below the mean position. A complete oscillation takes place in 20s and the motion is simple harmonic. Determine:

(a) The maximum couple tending to shear the holding down bolts of the turbine.

(b) The maximum acceleration of the ship during pitching.

(c) The direction in which the bow will tend to turn while rising, if the rotation of the rotor is clockwise, when looking from aft.

2 A vertical pivot bearing 200 mm diameter has a cone angle of 150^0. If the shaft supports an axial load of 25 kN and the coefficient of friction is 0.25, find the power lost in friction and the shaft rotates at 300 r.p.m, assuming:

(a) Uniform pressure.

(b) Uniform wear.

3 The external and internal radii of a friction plate of a single clutch are 120 mm and 60 mm respectively. The total axial thrust with which the friction surfaces are held together is 1500 N. For uniform wear, find the maximum, minimum and average pressure on the contact surfaces.

4 A certain machine requires torque of (14000+200 sin θ) N-m to drive it. Where θ is an angle of rotation of the shaft measure from some datum? The machine is directly coupled to an engine which produces a torque of (14000+2500 sin θ) N-m. The flywheel and other rotating parts attached to the shaft having a mass of 300 kg with radius of gyration of 50 cm. The mean speed is 60 rpm. Calculate:

(a) The percentage fluctuation of speed.

(b) The maximum angular acceleration of the flywheel.

5 With a neat sketch, explain the working of Hartnell governor.

6 Three masses m_1, m_2 and m_3 with masses 10 kg, 9 kg and 16 kg respectively revolve in the same plane at radii 10 cm, 12.5 cm and 5 cm respectively. The angular position of m_2 and m_3 are 60º and 135º respectively from m_1. Determine the position and magnitude of mass m_4 at radius15 cm to balance the system.

7 The cranks of a two-cylinder uncoupled inside cylinder locomotive are at right angles and are 300 mm long. The distance between the centre lines of the cylinder is 650 mm. The wheel centre lines are 1.6 m apart. The reciprocating mass per cylinder is 300 kg. The driving wheel diameter is 1.8 m. if the hammer blow is not to exceed 45 kN at 100 km/hr, determine:

(a) The fraction of the reciprocating masses to be balanced.

(b) The variation in tractive effort.

(c) The maximum swaying couple.

8 (a) Distinguish between longitudinal, transverse and torsional vibrations.

(b) What are the basic elements of a vibratory system? What is the degree of freedom?

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