Code: R7310303

R07

B.Tech III Year I Semester (R07) Supplementary Examinations December 2015

DYNAMICS OF MACHINERY

(Mechanical Engineering)

(For 2008 regular admitted batch only)

Time: 3 hours Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

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1 The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 r.p.m clockwise when viewed from the left. The radius of gyration of the rotor is 320 mm. Determine the gyroscopic couple and its effect when
(i) The ship turns right at a radius of 250 m with a speed of 25 km/hr.
(ii) The ship pitches with the bow rising at the angular velocity of 0.8 rad/sec.
(iii) The ship rolls at an angular velocity of 0.1 rad/sec.

2 A square threaded screw of mean diameter 30 mm and pitch of threads 5 mm is used to lift a load of 15 kN by a horizontal force applied at the circumference of the screw. Find the force required if the coefficient of friction between screw and nut is 0.02.

3 A power of 60 kW is transmitted by a multi plate clutch at 1500 r.p.m. Axial intensity of pressure is not to exceed 0.15 N/mm^2. The coefficient of friction for the surfaces is 0.15. The external radius of friction surface is 120 mm. Also the external radius is equal to 1.25 times the internal radius. Find the number of plates needed to transmit the required power. Assume uniform wear.

4 A cast iron flywheel is required to absorb 25000 N-m of energy as speed increased from 120 to 125 r.p.m. If the wheel is to be solid disc having a diameter eight times its thickness, determine its diameter. Density of cast-iron = 7200 kg/m^3.

5 Explain the terms and derive expressions for 'effort' and 'power' of a Porter governor.

6 The piston of a 60º twin V-engine has strokes of 120 mm. The connecting rod driving a common crank has a length of 200 mm. The mass of the reciprocating parts per cylinder is one kg and the speed of the crank shaft is 2500 r.p.m. Determine the magnitude of the primary and secondary forces.

7 The following data refer to a two- cylinder uncoupled locomotive:
Rotating mass per cylinder = 280 kg
Reciprocating mass per cylinder = 300 kg
Distance between wheels = 1400 mm
Distance between cylinder centers = 600 mm
Diameter of treads of driving wheels = 1800 mm
Crank radius = 300 mm
Radius of centre of balance mass = 620 mm
Locomotive speed = 50 km/hr
Angle between cylinder cranks = 90°
Dead load on each wheel = 3500 kg
Determine the: (i) Balancing mass required in the planes of driving wheels if whole of the revolving and two-third of the reciprocating mass are to be balanced. (ii) Swaying couple and variation in tractive force. (iii) Maximum and minimum pressure on the rails. (iv) Maximum speed of locomotive without lifting the wheels from the rails.

8 (a) What is meant by vibrations? How are they caused?
(b) What are free, damped and force vibrations? Explain.

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