

Code: R7310303

R7

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 A car is of total mass 3000 kg. It has wheel base equal to 2.5 m and track width equal to 1.5 m. The effective diameter of each wheel is 80 cm, and moment of inertia of each wheel is 1.0 kg.m^2 . The rear axle ratio is 4. The mass moment of inertia of engine rotating parts is 3 kg.m^2 and spin axis of engine parts is perpendicular to the spin axis of wheels. Determine the reaction at each wheel if car takes right turn of 100 m radius at 108 km/hr speed. Also determine critical speed. The height of C.G. is 0.5 m from ground and it is placed on the vertical line through geometric center of wheels.
- 2 A conical pivot supports a load of 25 kN, the cone angle being 120 degrees, and the intensity of normal pressure is not to exceed 0.25 MPa. The external radius is twice the internal diameter. Find the outer and inner radii of bearing surface. If the shaft rotates at 180 r.p.m and the coefficient of friction is 0.15, find the power loss in friction, assuming uniform pressure.
- 3 A cone clutch of semi cone angle 15° is used to transmit a power of 30 KW at 800 r.p.m. The mean frictional surface radius is 150 mm. The normal intensity of pressure at the mean radius is not to exceed 0.15 N/mm^2 . The coefficient of friction is 0.2. Assuming uniform wear, Determine :
 - (a) Width of the contact surface and
 - (b) Axial load (or force) needed to engage the clutch.
- 4 A cast iron flywheel used for the four stroke I.C. engine is developing 180 KW at 240 r.p.m. The hoop stress developed in the flywheel is 5 MPa. The total fluctuation of speed is to be limited to 3% of the mean speed. If the work done during the power stroke is $1/3^{\text{rd}}$ times more than the average work done during whole cycle, find:
 - (a) Mean diameter of the fly wheel.
 - (b) Mass of the flywheel.
 - (c) Cross-sectional dimensions of the rim when the width is twice the thickness. The density of the cast iron may be taken as 7300 kg/m^3 .

Contd. in Page 2

Code: R7310303

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- 5 With a neat sketch, explain the working of Hartnell governor.
- 6 (a) What you understand by static and dynamic balancing?
(b) The four masses m_1 , m_2 , m_3 , and m_4 having their radii of rotation as 200 mm, 150 mm, 250 mm and 300 mm are 200 kg, 300 kg, 240 kg and 260 kg in magnitude respectively. The angles between the successive masses are 45° , 75° , and 135° respectively. Find the position and magnitude of the balance mass required, if its radius of rotation is 200 mm.
- 7 A V-twin engine has the cylinder axes at right angle and connecting rods operate a common crank. The reciprocating mass per cylinder is 10 kg. The crank is 7.5 cm long and each connecting rod is 35 cm long. Show that the engine may be balanced for primary effects by means of a revolving balance mass. If the speed of the crank is 500 r.p.m, what is the maximum value of the resultant secondary force and in which direction does it act?
- 8 A horizontal spring mass system with coulomb damping has a mass of 5 kg attached to a spring of stiffness 980 N/m. if the coefficient of friction is 0.025, calculate:
(a) The frequency of free oscillations.
(b) The number of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 5 cm and
(c) The time taken to achieve this 50% reduction.
