Code :R7310303

R7

III B.Tech I Semester(R07) Supplementary Examinations, May 2011
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A four wheeled trolley car has total mass 2000kg. The car runs on rails of 1.4m gauge and rounds a curve of 30m radius at 36km/hr on a track of embankment slope of 10 degrees. The external diameter of wheel is 0.6m and each pair of axle has a mass of 200kg with radius of gyration of 250mm. the height of the centre of the gravity of the car above the wheel base in 1m. Determine the pressure on each rail allowing for centrifugal force any gyroscopic couple action.

2. A square threaded screw of mean diameter 30mm and pitch of threads 5mm is used to lift a load of 15kN 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. The external and internal radii of a friction plate of a single clutch are 120mm and 60mm respectively. The total axial thrust with which the friction surfaces are held together is 1500N. For uniform wear, find the maximum, minimum and average pressure on the contact surfaces.

4. An Otto cycle engine develops 45Kw at 180rpm with 90 explosions per minute. The change of speed from the commencement to the end power stroke must not exceed 0.5% of mean on either side. Find the mean diameter of the flywheel and rim cross-section having width four times the thickness so that the hoop stress does not exceed 3.5MPa. Assume that the flywheel stores 6% more energy than the energy stored by the rim and the work done during power stroke is 1.4 times the work done during the cycle. Take density of material to be 7300 kg/m^3.

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

6. (a) A shaft carries five masses m_1, m_2, m_3, m_4 and m_5 which revolve at the same radius in planes which are equidistant one from another. The magnitudes of the masses in planes 1, 3, and 4 are 40kg, 40 kg and 80 kg respectively. Determine the masses in planes 2 and 5 and their rotating balance.

   (b) Why is balancing necessary for rotors of high sped engines?

7. A four cylinder vertical engine has cranks 150 mm long. The planes of rotation of the first, second and fourth cranks are 400 mm, 200mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be complete primary balance.

8. (a) What is the logarithmic decrement? Derive the relation for the same.

   (b) What do you mean by the steady-state response of the system in case of forced vibration?

⋆ ⋆ ⋆ ⋆ ⋆