B. Tech Degree VI Semester Examination, April 2009

ME 602 DYNAMICS OF MACHINERY

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer ***ALL*** questions)

(8 x 5 = 40)

I. (a) What are the conditions for a body to be in equilibrium under the action of two forces, three forces, two forces and a torque?

(b) Explain the term dynamically equivalent system.

(c) Derive a relation to find the magnitude of Gyroscopic Couple.

(d) Explain Hunting of Governors.

(e) State and explain the conditions for Static and Dynamic balancing.

(f) Explain the effects of partial balancing in locomotives.

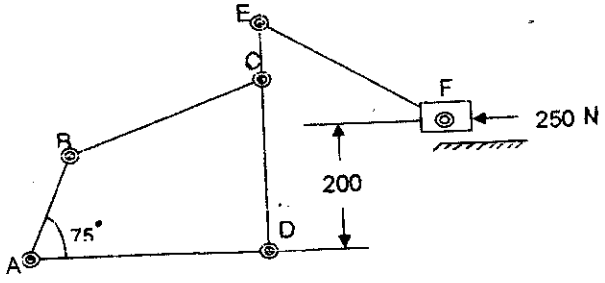
(g) Explain the phenomenon of creep in belt drive.

(h) Derive a relation for the torque transmitted by a multi-plate disc clutch.

PART B

(4 x 15 = 60)

II. For the static equilibrium of the mechanism, find the required input torque. Dimensions of links are AB = 150mm, BC=AD=500mm, DC = 300mm, CE = 100mm and EF = 450mm. (15)



OR

III. The crank and the connecting rod of a vertical single cylinder gas engine running at 1800 rpm are 60 mm and 240 mm respectively. The diameter of the piston is 80 mm and the mass of the reciprocating parts is 1.2Kg. At a point during the power stroke when the piston has moved 20mm from top dead centre position the pressure on the piston is 800kN/m^2. Determine

(i) the net force on the piston

(ii) the thrust on the sides of cylinder walls

(iii) the engine speed at which the above values are zero (15)

IV. The torque delivered by a two stroke engine is represented by T = (1000 + 300sin2θ – 500cosθ)Nm where θ is the angle turned by the crank from IDC. The engine speed is 250rpm. The mass of flywheel is 400kg and radius of gyration 400mm. Determine

(i) Power developed

(ii) Percentage fluctuation of speed

(iii) Angular acceleration of flywheel when the crank has rotated through an angle of 60 degree from IDC. (15)

OR

(Turn Over)

V. A 2.2 tonne racing car has a wheel base 2.4 m and a track of 1.4m. The centre of mass of the car lies at 0.6m above the ground and 1.4m from the rear axle. Equivalent mass of engine parts is 140kg with radius of gyration of 150mm. The back axle ratio is 5. The engine shaft and flywheel rotate clockwise when viewed from front. Each wheel has a diameter of 0.8m and a moment of inertia of 0.7kgm^2. Determine the load distribution on the wheels when the car is rounding a curve of 100m radius at a speed of 72km/hr to the left. (15)

VI. (a) What is meant by primary and secondary unbalance in reciprocating engines? (5)

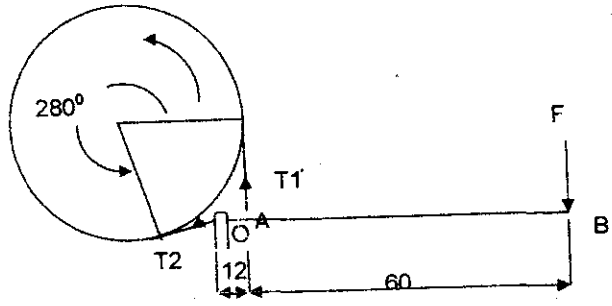
(b) Show that the resultant unbalanced force is minimum, when half of the reciprocating masses are balanced by rotating masses. (10)

OR

VII. Each crank and the connecting rod of a four crank in-line engine are 200 mm and 800 mm respectively. The outer cranks are set at 120^0 to each other and each has a reciprocating mass of 200 kg. The spacing between adjacent planes of cranks are 400 mm, 600 mm and 500 mm. If the engine is in complete primary balance, determine the reciprocating masses of the inner cranks and their relative angular positions. Also find the secondary unbalanced force if the engine speed is 210 rpm. (15)

VIII. (a) With the help of a neat sketch explain the principle of working of Rope brake Dynamometer. (5)

(b) The drum for a band brake of a crane is 30 cm diameter, the crane barrel is 35cm diameter, the angle of contact of band brake is 280^0 and the coefficient of friction between band and drum is 0.25. The brake lever is arranged as shown in the figure. AB = 60 cm, OA = 12 cm. Calculate the force F required to support a load of 10000N on the rope round the barrel. (10)



OR

IX. A rope drive transmits 100kW through a 160 cm diameter 45^0 grooved pulley running at 200 rpm. Angle of overlap is 140^0 and coefficient of friction between pulley and rope is 0.25. Mass of rope is 0.7kg/m and it can withstand a tension of 800N. Considering the centrifugal tension induced, determine,

(i) The number of ropes needed for transmitting the required power

(ii) The tension in the rope before starting. (15)

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