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06ME53

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017

Dynamics of Machines

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- 1 a. Explain equilibrium of following systems :
 i) 3 force member ii) Member with 2 forces and torque. (08 Marks)
 b. Explain the procedure for static force analysis of slider crank mechanism subjected to a force along line of stroke on reciprocating part. (12 Marks)
- 2 a. Define i) Coefficient of fluctuation of speed ii) Coefficient of fluctuation of energy. (04 Marks)
 b. List the differences between fly wheel and Governer. (04 Marks)
 c. A punching machine is required to punch 5 holes per minute of 50mm diameter in 40mm thick plate. The ultimate shear strength of plate material is 225 MPa. The punch has a stroke of 100mm. Find the power of motor required if mean speed of flywheel is 18m/s. If coefficient of fluctuation of energy is 4%, find the mass of the flywheel. (12 Marks)
- 3 a. Derive an expression for frictional torque in a single flat collar bearing assuming uniform pressure. (08 Marks)
 b. An open belt drive transmits 8 KW of power from a shaft rotating at 240 rpm to another shaft rotating at 160 rpm. The belt is 8mm thick. The diameter of smaller pulley is 600mm and the two shafts are 5m apart. The coefficient of friction is 0.25. If the maximum stress in the belt limited to 3N/mm^2 , find the width of the belt. (12 Marks)
- 4 Four masses A, B, C and D carried by a rotating shaft at radii 80mm, 100mm, 160mm and 120mm respectively are completely balanced. Masses B, C and D are 8kg, 4kg and 3kg respectively. Determine the mass A and relative angular positions of the four masses if the planes are spaced 500mm apart. (20 Marks)

PART - B

- 5 A four crank engine has two outer cranks set at 120° to each other and their reciprocating masses are each 400kg. The distance between the planes of rotation of adjacent cranks are 450mm, 750mm and 600mm. If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular positions for each of the inner cranks. If the length of each crank is 300mm length of each connecting rod is 1.2m and speed of rotation is 240 rpm, what is the maximum secondary unbalanced force? (20 Marks)
- 6 a. Define the following terms related to Governer :
 i) Sensitiveness ii) Isochronism iii) Controlling force iv) Hunting. (08 Marks)
 b. The arms of a Porter governer are 250mm long. The upper arms are pivoted on the axis of revolution, but the lower arms are attached to a sleeve at a distance of 50mm from the axis of rotation. The weight on the sleeve is 600N and the weight of each ball is 80N. Determine the equilibrium speed when the radius of rotation of the balls is 150mm. If the friction is equivalent to a load of 25N at the sleeve, determine range of speed for this position. (12 Marks)

- 7 a. Explain the Gyroscopic stability of a four wheel vehicle taking left turn. (10 Marks)
- b. The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 rpm clockwise when viewed from the stern. The radius of gyration of the rotor is 320mm. Determine the gyroscopic couple and its effect when the
- i) Ship turns right at a radius of 250m with a speed of 25km/h.
 - ii) Ship pitches with the bow rising at an angular velocity 0.8 rad/s.
 - iii) Ship rolls at an angular velocity 0.1 rad/s. (10 Marks)
- 8 a. Derive an expression for velocity and acceleration for a circular arc cam with flat faced follower when it is touching the circular flank. (08 Marks)
- b. A Tangent cam with straight working faces tangential to a base circle of 120mm diameter has a roller follower of 48mm diameter. The line of stroke of the roller passes through the axis of cam. The nose circle radius of the cam is 12mm and the angle between the tangential faces of cam is 90° . If the speed of the cam is 180 rpm. Determine the acceleration of the follower when
- i) During the lift, the roller just leaves the straight flank.
 - ii) The roller is at the top of nose. (12 Marks)
