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10AU54

Fifth Semester B.E. Degree Examination, June/July 2016
Dynamics of Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain Equilibrium with respect to two force and three force members. **(06 Marks)**

b. A four bar mechanism shown in Fig. Q1(b). The dimensions of various links are AB = 200mm, BC = 370mm, CD = 350mm, AD = 215mm, CE = 100mm. Determine the required value of "T_2" and various forces on links for the equilibrium of the system. **(14 Marks)**

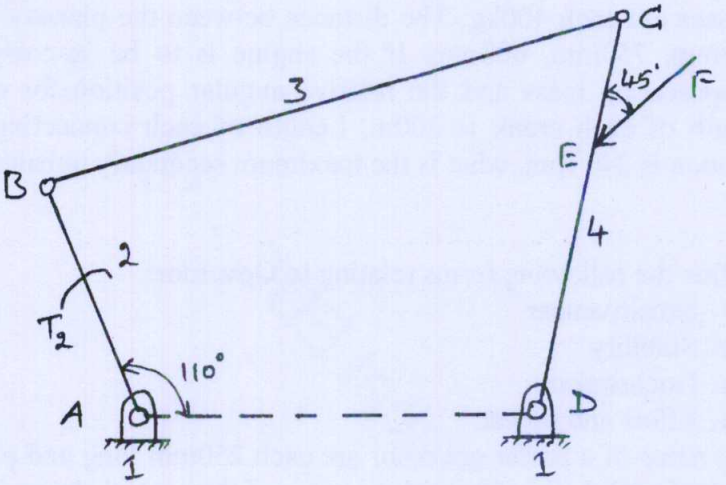

Fig. Q1(b)

2 a. Briefly discuss the following :
i) D' Alembert's Principle
ii) Dynamically Equivalent system. **(06 Marks)**

b. Explain the procedure with a neat sketch, for dynamic force analysis of slider – crank mechanism. **(14 Marks)**

3 a. With a neat sketch. Explain Turning moment diagram for a four stroke cycle internal combustion engine. **(05 Marks)**

b. A shaft fitted with a flywheel rotates at 250 rpm and drives a machine. The Torque of machine varies in a cyclic manner over a period of 3 revolutions. The Torque rises from 750N.m to 3000N.m uniformly during ½ revolutions and remains constant for one revolution, the cycle being repeated thereafter. Determine the power required to drive the machine and percentage fluctuation in speed, if the driving torque applied to the shaft is constant and the mass of the flywheel is 500kg with radius of gyration of 600mm. **(15 Marks)**

4 a. Derive an expression for displacement, velocity and Acceleration for a Tangent cam operating on a radial translating roller follower, when the roller has contact with straight Flank. **(12 Marks)**

b. Derive an expression for Displacement and velocity for a circulation arc cam operating a Flat – Faced follower, when the contact is on the circular Flank. **(08 Marks)**

PART – B

5 a. Briefly explain the static and Dynamic Balancing. **(04 Marks)**

b. A shaft carries 4 masses A, B, C, and D placed in parallel planes perpendicular to the shaft axis and in this order along the shaft. The masses 'B' and 'C' are 40 and 28 kg and both are at 160mm radius. While the masses in planes 'A' and D are at 200mm radius. Angle between 'B' and 'C' is 100°, B and A is 190°, both angles measured in the same sense. Planes 'A' and 'B' are 250mm apart; 'B' and 'C' are 500mm apart. If the shaft is to be in complete balance, Determine.

i) Masses in planes 'A' and 'D'
ii) Distance between planes C and D
iii) Angular Position of mass 'D'. **(16 Marks)**

6 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, 600mm. If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular position for each of the inner cranks. If the length of each crank is 300m, Length of each connecting rod is 1.2m and the speed of rotation is 240 rpm, what is the maximum secondary unbalanced force? **(20 Marks)**

7 a. Define the following terms relating to Governor:

i) Sensitiveness
ii) Stability
iii) Isochronism
iv) Effort and power. **(08 Marks)**

b. The Arms of a porter governor are each 250mm long and pivoted on the governor axis. The mass of each ball is 5kg and the mass of the central sleeve is 30kg. The radius of rotation of the balls is 150mm when the sleeve begins to rise and reaches a value of 200mm for maximum speed. Determine the speed range of governor. If the Friction at the sleeve is equivalent of 20N of load at the sleeve, Determine how the speed range is modified. **(12 Marks)**

8 a. With a neat sketch, derive an expression for the Gyroscopic couple, produced by a rotating Disc. **(08 Marks)**

b. A ship is propelled by a turbine rotor which has a mass of 500kg and has speed of 2100rpm. The rotor has a radius of gyration of 0.5m and rotates in clockwise direction when viewed from stern. Find the gyroscopic effect in the following conditions.

i) The ship runs at a speed of 16 knots (1knot = 1860 m/hr). It stress to the left in a curve of 60m radius.
ii) The ship pitches 6° above and 6° below the horizontal position. The bow descends with its maximum velocity. The motion due to pitching is SHM and the periodic time is 20secs.
iii) The ship rolls at a certain instant has an angular velocity of 0.03 rad/sec clockwise when viewed from the stern. **(12 Marks)**

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