Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Dynamics of Machinery

Time: 3 hrs.

Max. Marks:100

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

PART – A

In a four bar mechanism shown in Fig.Q1, the torque T₃ and T₄ have magnitude of 50 Nm 1 and 40 Nm respectively. For static equilibrium of the mechanism. Determine the required input torque T_2 , AD = 70 mm, AB = 30 mm, BC = 75 mm, CD = 35 mm.

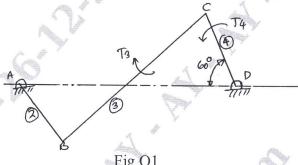


Fig.Q1

(20 Marks)

- 2 A cast iron flywheel is required to absorb 25000 Nm of energy as speed is increased from 120 to 125 rpm. If the wheel is to solid disc having diameter 8 times its thickness. Determine its diameter, density of CI = 7200 kg/m³. (10 Marks)
 - b. A steam engine develops 300 kW at 120 rpm. The coefficient of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 1\%$ of the mean speed. Find the mass of the flywheel required, if the radius of gyration is 2m.

(10 Marks)

- Derive the expression for centrifugal tension in belt drive system. 3 (04 Marks)
 - A transmission shaft, rotating at 500 rpm, drives a milling machine which required 3.75 kW at 750 rpm. A 300 mm diameter CI pulley is mounted on the transmission shaft. A belt of 4.75 mm thick and density of 970 kg/m³ was used. The allowable stress in belt is 2 MPa. Two pulleys rotate in opposite direction and the centre distance of the shaft is 750 mm. Determine the width of the belt if $\mu = 0.3$. (16 Marks)
- Determine the masses to be added at planes L and P at radii 600 mm if the system is to be 4 dynamically balanced, is shown in Fig.Q4.

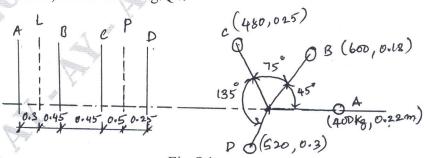


Fig.Q4

(20 Marks)

PART - B

- The reciprocating masses of first three cylinders of a four cylinder engine are 4.1, 6.2 and 7.4 tonnes. The centre lines of three cylinders are 5.2 m, 3.2 m and 1.2 m from the fourth cylinder. If the cranks of all cylinders are equal. Determine the reciprocating mass of 4th cylinder and angular position of crank such that system is completely balanced for the primary and secondary force and couple. If the crank radius 80 cm, connecting rod 3.8 m and speed of the engine 75 rpm. Find the maximum unbalanced secondary force and crank angle at which it occurs. (20 Marks)
- 6 a. Define the following terms:
 - (i) Stability
- (ii) Sensitiveness
- (iii) Isochronism

(iv) Effort

(v) Power

(05 Marks)

- b. The arms of a porter governor are each 300 mm long and are pivoted on the governor axis. Mass of each ball is 2 kg. At mean speed 150 rpm. The arm makes 30° with the vertical. Determine the central load and sensitivity of the governor if the sleeve movement is ±25 mm.

 (15 Marks)
- 7 a. Derive an expression for angle of heel for a motor cycle taking left from with usual notations and neat sketch. (12 Marks)
 - b. Explain with sketches the effect of gyroscopic couple while aeroplane steering to right, if engine runs in clockwise when viewed from the tail end. (08 Marks)
- 8 a. Explain with neat sketches different types of cams.

(08 Marks)

- b. Draw the profile of a cam operating with knife edge follower for the following data:
 - i) If lifts the follower through 3.75 cm during 60° of rotation with SHM.
 - ii) The follower remains at rest for next 40°.
 - iii) The follower returns to original position for next 90° rotation of cam.
 - iv) The follower remains at rest for the rest of rotation.

The least radius of cam is 50 mm, if the cam rotates at 300 rpm.

(12 Marks)

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