

CBCS Scheme

USN

15MR42

Fourth Semester B.E. Degree Examination, June/July 2017 Theory of Machines

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. With a neat sketch, explain Whit-worth Quick return mechanism. State its application. (08 Marks)
- b. State the conditions for a link to be in equilibrium.
 - (i) When two forces act.
 - (ii) When three forces act.
 - (iii) When two forces and a torque acts. (06 Marks)
- c. What is free body diagram? (02 Marks)

OR

- 2 a. Determine the required input torque on the Crank of a slider mechanism as shown in Fig. Q2 (a) for static equilibrium. (10 Marks)

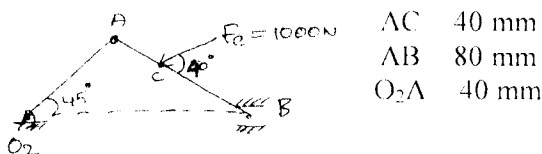


Fig. Q2 (a)

- b. Distinguish between machine, mechanism and structure. (06 Marks)

Module-2

- 3 a. Briefly explain D'Alembert's principle on rectilinear motion and angular motion. (06 Marks)
- b. State the laws of friction. (05 Marks)
- c. Explain creep, slip and materials used in belts. (05 Marks)

OR

- 4 a. Derive an expression for total frictional torque for a pivot bearing subjected to uniform pressure. (08 Marks)
- b. A pulley is driven by a flat belt 100 mm wide and 6 mm thick. The density of belt material is 1000 kg/m³. The angle of lap is 120° and the co-efficient of friction is 0.3. The maximum stress in belt does not exceed 2 MPa. Find the maximum power that can be transmitted and the corresponding speed of the belt. (08 Marks)

Module-3

- 5 A shaft has three eccentrics of mass 1 kg each. The central plane of the eccentrics is 50 mm apart. The distances of the centres from axis of rotation are 20, 30 and 20 mm and their angular positions are 120° apart. If the shaft is balanced by adding two masses at a radius 70 mm and at a distance of 100 mm from central plane of middle eccentric. Find the amount of masses and their angular positions. (16 Marks)

OR

- 6 a. Discuss about static balancing and dynamic balancing. (04 Marks)
 b. Prove that the resultant unbalanced force is minimum when half of the reciprocating masses are balanced by rotating masses i.e when $C = \frac{1}{2}$. (12 Marks)

Module-4

- 7 a. With a neat sketch, explain effect of gyroscopic couple on steering of ship when rotor turns clockwise. (08 Marks)
 b. Each arm of a porter governors is 300 mm long and is pivoted on the axis of the governor. Each ball has a mass of 6 kg and the mass of sleeve is 18 kg. The radius of rotation of ball is 200 mm when the governor begins to lift and 250 mm when the speed is maximum. Determine maximum and minimum speed and range of governor. (08 Marks)

OR

- 8 a. Define : (i) Sensitiveness (ii) Stability (iii) Hunting (iv) Effort of governor (08 Marks)
 b. Derive an expression for angle of heel of a two wheeler, while taking a turn. (08 Marks)

Module-5

- 9 a. Derive expression for displacement velocity and acceleration of a roller follower making contact with straight flank of symmetrical tangent cam. (10 Marks)
 b. Discuss the different types of follower displacement diagrams. (06 Marks)

OR

- 10 The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent:
 Minimum radius of cam = 25 mm
 Roller diameter = 7.5 mm
 Lift = 28 mm
 Offset of follower axis = 12 mm towards right.
 Angle of ascent = 60°
 Angle of descent = 90°
 Angle of dwell between ascent and descent = 45°
 Draw the profile of cam. (16 Marks)

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