



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Automobile Engineering

Semester End Examination; May / June - 2019

Theory of Machine - I

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. What is the difference between the following : 8
 - i) Machine and Structure ii) Machine and Mechanism iii) Higher pair and Lower pair
- b. With neat sketch, explain; i) Beam engine mechanism ii) Scotch Yoke mechanism 12
- 2. Sketch and explain the following :
 - a) Peauallians's straight line mechanism 6
 - b) White-Worth's quick return motion mechanism 8
 - c) Geneva wheel 6

UNIT - II

- 3. In the mechanism shown in Fig. (3), the crank 2 rotates at 3000 rpm. Find the velocity of the point 'C' and angular velocity of the link '3'. OA = 50 mm, AB = 175 mm, AC = 75 mm, AB = 125 mm. Solve the problem in both instantaneous centre method and relative velocity method. 20

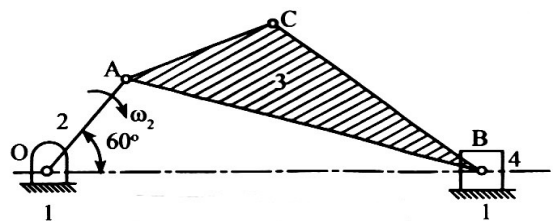


Fig - 3

- 4. The crank O₂A of four bar chain shown in Fig. (4) rotates at 100 rad/s. Determine velocity of the point C and angular velocity of the links 3 and 4. O₂A = 120 mm, AB = 160 mm, O₄B = 120 mm, AC = 80 mm. Solve the problem in both IC method and Relative velocity method. 20

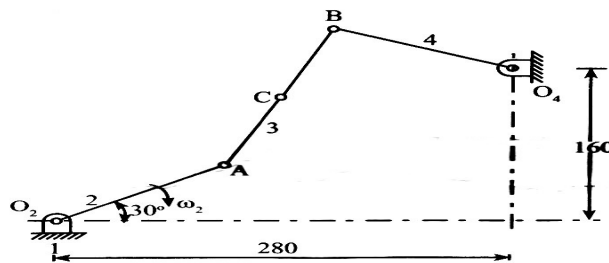


Fig - 4

UNIT - III

- 5. In the mechanism shown in Fig. (5), the crank OA rotates at 20 rpm anticlockwise and given motion to the sliding block B and D. OA = 300 mm, AB = 1200 mm, BC = 450 mm and CD = 450 mm. 20
 Determine; i) Velocity and Acceleration of sliding at D ii) Angular acceleration of CD

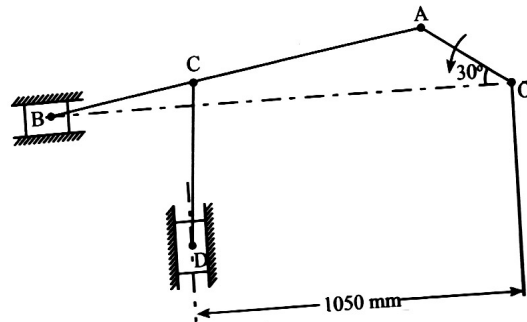


Fig - 5

- 6 a. Explain Coriolis component of acceleration. 4
- b. The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank rotates in clockwise direction at 120 rad/s. Find with the help of Klein's construction, velocity and acceleration of piston at the instant when the crank is at 30° to TDC. 16

UNIT - IV

- 7 a. Derive a relationship for length of path of contact. 10
- b. The number of teeth on each spur gear in mesh is 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. 10
- 8 a. Explain the advantages of Epicyclic gear train. 4
- b. An epicyclic gear train shown in Fig. (8b), the internal wheel A, B and compound wheel C and D rotates about axis O. The number of teeth on E = F = 18, C = 18, D = 26.
 - i) Find the number of teeth on A and B
 - ii) If the arm makes 150 rpm CW and A is fixed, find the speed of B
 - iii) If the arm makes 150 rpm CW and wheel A makes 15 rpm CCW, find the speed of B

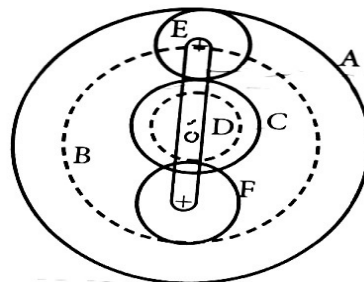


Fig - 8 (b)

UNIT - V

- 9. A roller follower cam with a roller diameter of 10 mm is rotating clockwise. The lift of the cam is 30 mm and the axis of the follower is offset to the right by a distance of 5 mm. The follower completes the lift with SHM during 120° of cam rotation. The dwell at lift is 60° of cam rotation. First half of the fall takes place with uniform velocity and the second half with VARM during 120° of cam rotation. The next is the dwell. Draw the cam profile. 20
- 10 a. Discuss classification of follower and cam with the help of neat sketches. 10
- 10 b. Discuss a relationship for displacement, velocity and acceleration of a tangential cam with roller, when follower is in contact with straight flanks. 10