

CBCS SCHEME

15MA42

Fourth Semester B.E. Degree Examination, June/July 2019

Theory of Machines

Time: 3 hrs.

Max. Marks: 80

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

Module-1

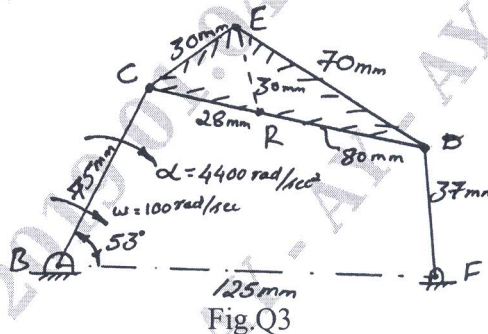
- 1 a. Define the following :
 (i) Kinematic Chain (ii) Mechanism (iii) Inversions (iv) Degree of freedom
 (08 Marks)
- b. Why Inversions of Mechanisms? Explain Inversions of four bar chain with two examples with neat sketch.
 (08 Marks)

OR

- 2 a. Explain with a neat sketch, crank and slotted lever quick return mechanism. (08 Marks)
- b. Explain with a neat sketch:
 (i) Ratchet and Pawl Mechanism (ii) Geneva Wheel Mechanism (08 Marks)

Module-2

- 3 A 4-bar mechanism is as shown in Fig.Q3. Crank BC rotates with an angular velocity of 100 rad/sec and an angular acceleration of 4400 rad/sec² at instant when the crank makes an angle 53° to horizontal. Draw acceleration polygon and determine the linear acceleration of point E and R and angular acceleration of link 3. (16 Marks)



OR

- 4 In the mechanism shown in Fig.Q4. The crank rotates at a uniform speed of 60 rpm CW. The line of stroke of ram is perpendicular to OA. Determine the velocity and acceleration of D. Illustrate Coriols component of acceleration. (16 Marks)

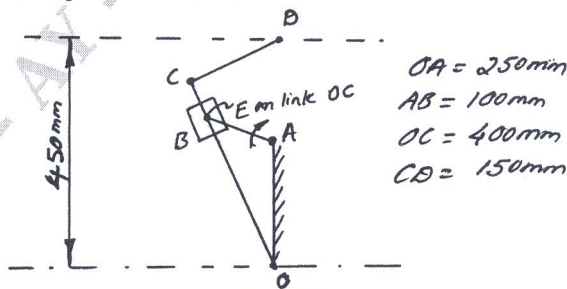


Fig.Q4
1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Write a note on (i) Law of Gearing (ii) Methods of avoiding interference. (08 Marks)
 b. Derive the expression for characteristics of Involute Action. (08 Marks)

OR

- 6 a. With neat sketch, explain types of Gear trains. (06 Marks)
 b. An epicyclic gear train is constructed as follows. A fixed annular wheel A and a small concentric wheel B are connected by a compound wheel A_1 and B_1 . A_1 gearing with A and B_1 with B. The compound wheel revolves on a stud which is carried around an arm which revolves about the axis A and B, A has 130 teeth. B has 20 teeth, B_1 has 80 teeth. Pitch of A and A_1 being twice that of B and B_1 . How many revolution B will mate for one revolution of arm. Sketch the arrangement. (10 Marks)

Module-4

- 7 a. Derive an expression to determine frictional torque in flat collar bearing for uniform wear. (06 Marks)
 b. A vertical shaft 140 mm diameter rotating at 120 rpm rests on a flat end footstep bearing. The shaft carries a vertical load of 30 kN. The coefficient of friction is 0.06. Estimate the power lost in friction assuming (i) Uniform pressure and (ii) Uniform wear. (10 Marks)

OR

- 8 a. Derive an expression for ratio of Belt Tensions. (06 Marks)
 b. An open belt drive is used to connect two parallel shafts 4m apart. The diameter of bigger pulley is 1.5m and that of the smaller pulley 0.5m. The mass of the belt is 1 kg/m length. The maximum tension is not to exceed 1500 N. The coefficient of friction is 0.25. The bigger pulley, which is the driver, runs at 250 rpm. Due to slip, the speed of the driven pulley is 725 rpm. Calculate the power transmitted, power lost in friction and the efficiency of the drive. (10 Marks)

Module-5

- 9 A cam with 3 cm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to knife edge follower as defined below:
 (i) Follower to move outward through 3 cm during 120° of cam rotation with SHM.
 (ii) Dwell for next 60°
 (iii) Follower return to its starting position during next 90° with uniform acceleration and retardation motion.
 (iv) Dwell for remaining period.
 Draw the cam profile assuming: follower axis passes through cam axis. Also determine max velocity and acceleration. (16 Marks)

OR

- 10 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. (08 Marks)
 b. The particulars of a symmetrical tangent cam operating a roller follower are given below:
 Least radius of cam = 30 mm; roller radius = 20 mm ; angle of ascent = 75° ;
 Total lift = 20 mm ; Speed of cam shaft = 600 rpm.
 Calculate the (i) Principal dimensions of cam (ii) Equation of displacement curve when follower is in contact with straight flank and circular nose. (08 Marks)
