CBCS SCHEME

USN

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Kinematics of Machines

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain: (i) Kinematic pair (ii) Types of links (iii) Grashaf's criterian **(06 Marks)**
b. Explain with neat sketches:
(i) Ratchet and Pawl mechanism
(ii) Toggle mechanism **(10 Marks)**
c. Define: (i) Inversion (ii) Degree of freedom
(iii) Mechanism (iv) Kinematic chain **(04 Marks)**

OR

2 a. Explain the construction and working of Peaucillier's mechanism with a neat sketch. Prove that it generates an exact straight line. **(10 Marks)**
b. With neat sketch, explain Geneva wheel mechanism. **(10 Marks)**

Module-2

3 The crank of a slider crank mechanism is 480 mm long and rotates at 20 rad/sec in the counter clockwise direction. It has a connecting rod of 1600 mm long. Determine the following when the crank is at 60° from the 1 DC. Determine:
(i) Velocity of slider
(ii) Angular velocity of connecting rod
(iii) Position and velocity of a point "P" on the connecting rod and having least absolute velocity. **(20 Marks)**

OR

4 a. Explain Klein's construction for slider crank mechanism. **(10 Marks)**
b. Define instantaneous centre and state, explain the types of instantaneous centres. **(10 Marks)**

Module-3

5 Using complex algebra derive expression for velocity and acceleration of the piston and angular acceleration of connecting rod for a reciprocating engine mechanism. Use these expressions to find the above, if the crank length is 50 mm, connecting rod is 200 mm long crank angle is 30°. The crank rotates at a constant speed of 3000 rpm. **(20 Marks)**

OR

6 In a four bar mechanism ABCD, link AB = 300 mm, BC = 360 mm, CD = 360 mm and the fixed link AD is 600 mm. The angle BAD = 60°. The link AB has an angular velocity of 10 rad/sec and angular acceleration of 30 rad/sec both clockwise. Determine the angular velocity and angular acceleration of link BC and CD by using complex algebra method. **(20 Marks)**

Module-4

7 a. Derive an expression for minimum number of teeth on pinion to avoid interference.
(10 Marks)

b. A 2.5 mm module, 20° pinion with 36 teeth drives a gear with 60 teeth. If the centre distance is increased by 0.65 mm. Calculate:
(i) The radii of the operating pitch circle
(ii) The operating pressure angle
(iii) Backlash produced **(10 Marks)**

OR

8 An epicyclic gear train, the internal wheels A, B and the compound wheel C and D rotate independently about the axis "0". The wheel E and F rotate on pin fixed to the arm G. E gears with A and C, and F gears with B and D. All the wheels have same pitch and the number of teeth on E and F are 18, C = 28, D = 26.
(i) Sketch the arrangement
(ii) Find the number of teeth on A and B
,(iii) If arm G makes 150 rpm CW and A is fixed, find speed of B. **(20 Marks)**

Module-5

9 Construct the profile of a cam to suit the following specification.
Cam shaft diameter = 40 mm
Least radius of CAM = 25 mm
Diameter of roller = 25 mm
Angle of lift = 120°
Angle of fall = 150°
Lift of the follower = 40 mm
Number of pauses are two of equal interval between motions. During the lift the motion is SHM. During the fall the motion is UARM. The speed of the cam shaft is uniform. The line of stroke is center of the cam. **(20 Marks)**

OR

10 a. Define the following terms related to cam:
(i) Lift
(ii) Dwell
(iii) Pressure angle
(iv) Base angle **(08 Marks)**

b. Derive an expression for displacement, velocity and acceleration for a circular arc cam operating a flat faced follower when the contact is on the circular flank. **(12 Marks)**