PVP 14

Code: ME4T4, AE4T4

II B.Tech - II Semester – Regular/Supplementary Examinations – April 2019

KINEMATICS OF MACHINERY

(Common for ME, AE)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11 x 2 = 22 M

1.

a) Differentiate between lower pair and higher pair with examples.

b) Define transmission angle of a four-bar mechanism. What is the worst value of transmission angle?

c) What is meant by instantaneous centre? Write the equation to determine the number of instantaneous centre of a mechanism.

d) What is coriolis component of acceleration? Briefly explain.

e) List out the applications of straight line motion mechanisms.

f) Draw the polar velocity diagram for a hook's joint.

g) State the expression for maximum velocity and acceleration of a follower moves with simple harmonic motion.

h) What is the signification of pressure angle in cam?

i) What is the role of idlers in gear trains?

j) In a compound gear train, the drivers have 25, 50, 75 and 100 teeth and the follower have 15, 30, 40 and 65 teeth. What is the velocity ratio of the compound gear train?

k) What is a reverted gear train and mention its practical applications?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Briefly explain the following terms :

i) Completely constraint motion,

ii) Successfully constraint motion,

iii) Kinematic chain, and

iv) Inversion 6 M

b) Explain the inversion of four-bar chain with examples. 10 M

3. The dimensions and configuration of the four bar mechanism, shown in Figure 1, are as follows: P_1A=300 mm; P_2B = 360mm; AB = 360 mm, and P_1P_2 = 600 mm. The angle $AP_1P_2 = 60°$. The crank P_1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s^2 , both clockwise. Determine the angular

velocities and angular accelerations of P_2B, and AB and the velocity and acceleration of the joint B. 16 M

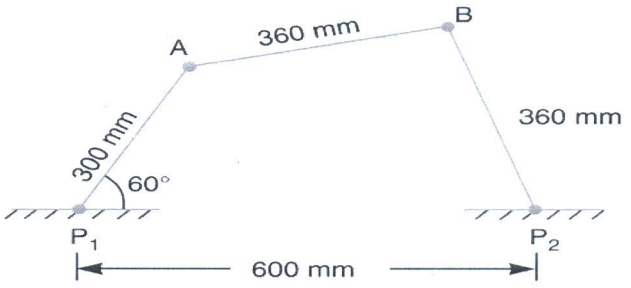

Figure 1

4. a) Draw the sketch of a mechanism in which a point traces an exact straight line. The mechanism must be made of only revolute pairs. Prove that the point traces an exact straight line motion. 8 M

   b) The angle between the axes of two shafts connected by Hooke's joint is 18°. Determine the angle turned by the driving shaft when i) the velocity ratio is maximum and unity. ii) Acceleration of the driven shaft is maximum, minimum and zero. 8 M

5. Construct the profile of a cam to suit the following specifications: 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 S.H.M. During the fall the motion is uniform

acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the centre of the cam. 16 M

6. a) State and prove the law of gearing. 4 M

b) In an epicyclic gear train as shown in figure 2, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth are : $T_C = 28$; $T_D = 26$; $T_E = T_F = 18$.

i. Find the number of teeth on A and B ;
ii. If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B ; and
iii. If the arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m. counter clockwise ; find the speed of wheel B. 12 M

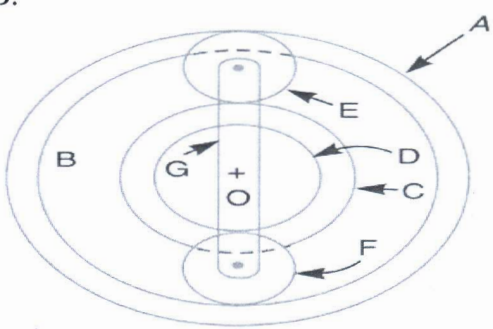

Figure 2