PVP 14

Code: ME4T4, AE4T4

II B.Tech - II Semester – Regular/Supplementary Examinations
October 2020

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) When a linkage becomes mechanism?
b) Define transmission angle of a four bar mechanism. What are the maximum and minimum values of transmission angle?
c) State the Kenneddy's three centers in line theorem of instantaneous centers.
d) Find the resultant acceleration of an 80 mm radius crank rotating at a constant angular velocity of 10 m/s, at the crank pin position.
e) Define rubbing velocity.
f) What is the use of Pantograph?
g) Distinguish between Ackerman and Davis steering gears.
h) Draw the displacement, velocity and acceleration diagrams for a follower when it moves with simple harmonic motion.
i) Define the term jumping speed of a cam.

j) Define the term: Module and pitch circle diameter of a spur gear.

k) What are the special advantages of epicyclical gear trains?

PART – B

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

3 x 16 = 48 M

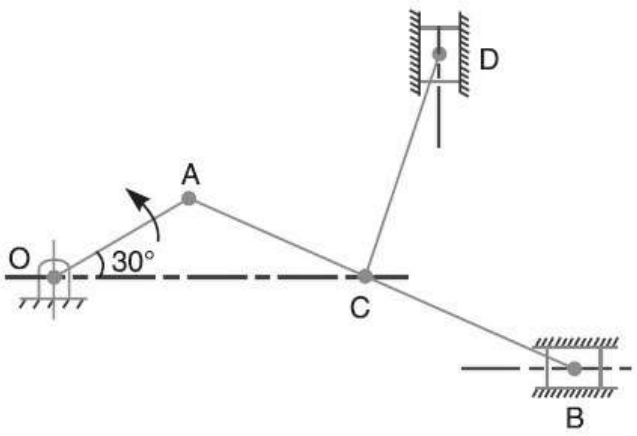
2. Sketch and describe the working of two different types of quick return mechanism. Derive an expression for the ratio of times taken in forward and return stroke for one of these mechanisms. 16 M

3. The dimensions of the various links of a mechanism, as shown in Figure 1 are as follows: OA = 80 mm ; AC = CB = CD = 120 mm. If the crank OA rotates at 150 r.p.m. in the anticlockwise direction, find, for the given configuration: 16 M

   i) Velocity and acceleration of B and D

   ii) Rubbing velocity on the pin at C, if its diameter is 20 mm

   iii) Angular acceleration of the links AB and CD.



(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 joined by Hooke's joint is 25º. The driving shaft rotates at a uniform speed of 180 rpm. The driven shaft carries a steady load of 7. 5 kW. Calculate the mass of the flywheel of the driven shaft if its radius of gyration is 150 mm and the output torque of the driven shaft does not vary by more than 15% of the input shaft. 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

Numbers 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. In an epicyclic gear train, 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 numbers of teeth are: $T_C = 28$; $T_D = 26$; $T_E = T_F = 18$.
   a) Sketch the arrangement 6 M
   b) Find the number of teeth on A and B 4 M
   c) If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B 3 M
   d) 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. 3 M