PVP 12

Code: ME4T4

II B.Tech - II Semester – Regular Examinations - JUNE 2015

KINEMATICS OF MACHINERY
(MECHANICAL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Show that the locus of the midpoint of the link connecting the two sliders in an elliptical trammel is a circle. 7 M

   b) Why are the parallel-crank four bar linkage and deltoid linkage considered special case of four-link mechanism? 7 M

2. Describe the Watt's parallel mechanism for straight line motion and derive the condition under which the straight line is traced. 14 M

3. Two inclined shafts are connected by means of a universal joint. The speed of the driving shaft is 1000 r.p.m. If the total fluctuation of speed of the driven shaft is not to exceed 12.5% of this, what is the maximum possible inclination between the two shafts?
   With this angle, what will be the maximum acceleration to which the driven shaft is subjected and when this will occur? 14 M

4. In a Whitworth quick return motion mechanism, as shown in Figure 1. OA is a crank rotating at 30 r.p.m. in a clockwise direction. The dimensions of various links are: OA = 150 mm; OC = 100 mm; CD = 125 mm; and DR = 500 mm. Determine the acceleration of the sliding block R and the angular acceleration of the slotted lever CA. 14 M

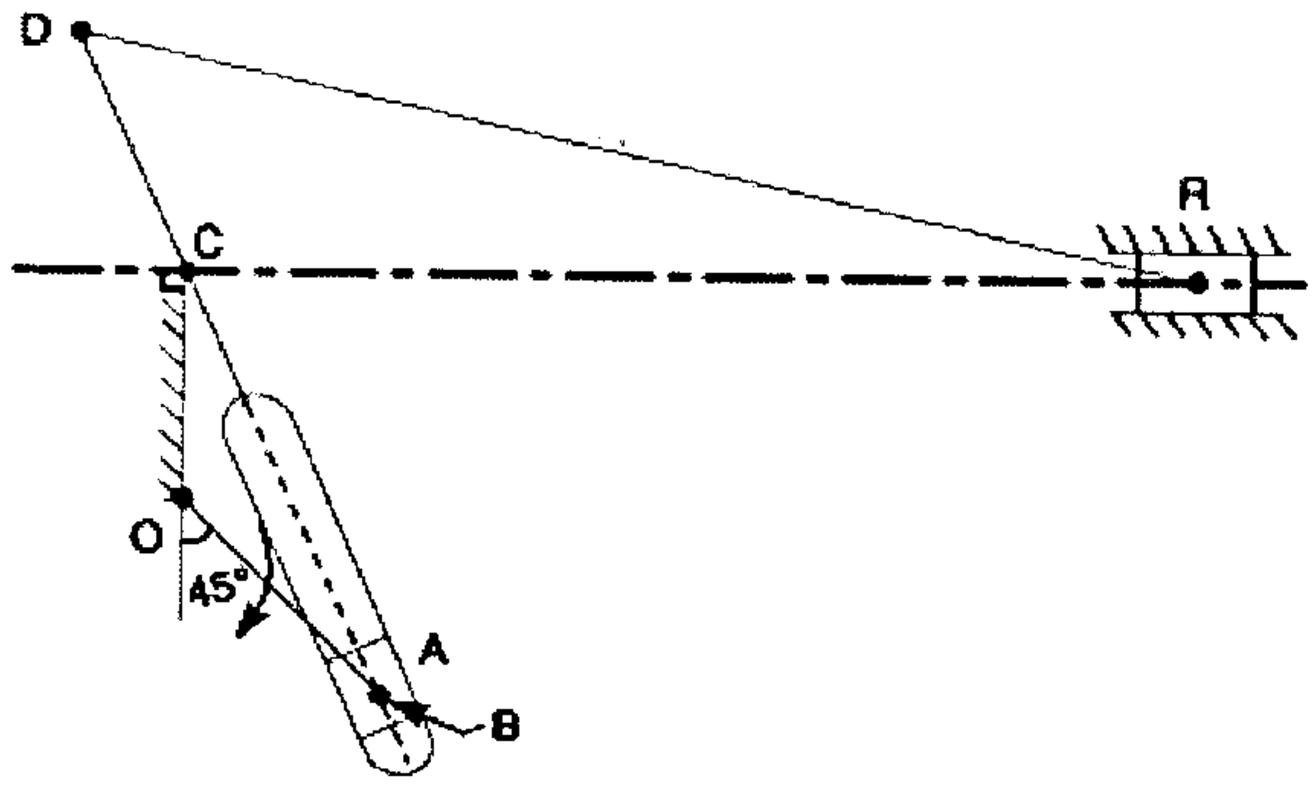

Figure 1

5. The suction valve of a four stroke petrol engine is operated by a circular arc cam with a flat faced follower. The lift of the follower is 10 mm; base circle diameter of the cam is 40 mm and the nose radius is 2.5 mm. The crank angle when suction valve opens is 4° after top dead centre and when the suction valve closes, the crank angle is 50° after bottom dead centre. If the cam shaft rotates at 600 r.p.m., determine: 14 M

i) maximum velocity of the valve, and

ii) maximum acceleration and retardation of the valve.

6. An open belt drive connects two pulleys 1.2 m and 0.5 m diameter on parallel shafts 3.6 m apart. The belt has a mass of 1 kg/m length and the maximum tension in it is not to exceed 2 kN. The 1.2 m pulley, which is the driver, runs at 200 r.p.m. Due to the belt slip on one of the pulleys, the velocity of the driven shaft is only 450 r.p.m. If the coefficient of friction between the belt and the pulley is 0.3, find: 14 M

i) Torque on each of the two shafts,
ii) Power transmitted,
iii) Power lost in friction, and
iv) Efficiency of the drive.

7. a) Prove that for two involute gear wheels in mesh, the angular velocity ratio does not change if the centre distance is increased within limits, but the pressure angle increases. 4 M

b) A pinion having 20 teeth engages with an internal gear having 80 teeth. If the gears have involute profiled teeth with 20^0 pressure angle, module of 10 mm and addendum of 10 mm, find the path of contact, arc of contact and contact ratio. 10 M

8. In an epicyclic gear train, the internal wheels A and B and the compound wheels C and D rotates independently about axis O. The wheels E and F rotates on pins fixed to the arm G. E gears with A & C and F gears with B & D. All the

wheels have the same module and the number of teeth are:
$T_C = 28$, $T_D = 26$, $T_E = T_F = 18$. 14 M

i) Sketch the arrangement;

ii) Find the number of teeth on A and B;

iii) If arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of wheel B;

iv) If arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m counter clockwise, find the speed of wheel B.