Code: 9A21506

R09

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

MECHANISMS & MECHANICAL DESIGN

(Aeronautical Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) In a crank and slotted lever type quick return motion mechanism, the driving link is 80 mm. While the distance between the fixed centers is 140 mm. Find the ratio of the time of cutting stroke to that of return stroke.

(b) Explain the inversions of single slider crank chain with a neat sketches.

2 Draw the profile of a cam that gives a lift of 40 mm to a rod carrying a 20 mm diameter roller. The axis of the roller passes through the centre of the cam. The least radius of the cam is 50 mm, the rod is to be lifted with simple harmonic motion during out stroke with an angle of 90 degree and 30 degree dwell and returned with deceleration motion about 120 degree and remaining is dwell. Determine the maximum velocity and maximum acceleration during the lifting and return strokes. The cam rotates at 60 rpm clockwise.

3 In an epicyclic train an annular wheel A having 54 teeth meshes with a planet wheel B which gears with a sum wheel C, the wheels A and C are being coaxial. The wheel B is carried on a pin fixed on one end of arm P which rotates about the axis of the wheels A and C. If the wheel A makes 20 rpm in a clock wise direction and the arm P rotates at 100 rpm in the anticlockwise direction and the wheel C has 24 teeth, determine the speed of arm P. Determine the sense of rotations of gears A,B,C and P.

4 Each wheel of a motor cycle is 600 mm diameter and has a moment of inertia of 1.2 kg-m^2. The total mass of the motor cycle and the rider is 180 kg and the combined center of the mass is 580 mm above the ground level when the motor cycle is upright. The moment of inertia of the rotating parts of the engine is 0.2 kg-m^2. The engine speed is five times the speed of the wheels and is in the same sense. Determine the angle of heel necessary when the motor cycle takes a turn of 35 m radius at a speed of 54 kmph.

5 (a) In a four-link mechanism, the dimensions of the links are as under AB = 50 mm, BC = 66 mm, CD = 56 mm, and AD = 100 mm. At the instant when angle DAB = 450, the link AB has an angular velocity of 9 rad/s in the counter-clockwise direction. Determine,
(i) The velocity of point C.
(ii) The velocity of point E on the link BC when BE = 40 mm.
(iii) The angular velocities of the links BC and CD.

(b) Explain the inline center theorem with a neat sketch.

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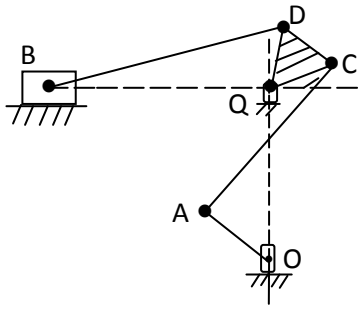
6 In the mechanism shown in figure. The crank OA rotates at 50 rpm and the lengths of the links are OA = 125 mm, AC = 600 mm, QC = 150 mm, QD = 150 mm, CD = 130 mm, BD = 550 mm and OQ = 625 mm. When the angle AOQ = 45°? Determine:
(a) The linear acceleration of the slider at B.
(b) The angular acceleration of the links AC, CQD and BD.



7 Find the velocity and acceleration of a tangent cam with roller follower when the roller is on the flank and when the roller is on the nose.

8 A hollow shaft, 500 mm outside diameter and 300 mm inside diameter, is supported by two bearings 6 m apart. The shaft is driven by a flexible coupling at one end and drives a ship's propeller at 100 rev/min. The maximum thrust on the propeller is 500 kN when the shaft is transmitting 6000 KW. The shaft weighs 60 kN. Determine the maximum shear stress in the shaft considering the weight of the shaft and the column effect. Assume Kb = 1.5 and Kt = 1.0.

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