

B.E DEGREE EXAMINATIONS: NOV / DEC 2014

(Regulation 2009)

Fourth Semester

MECHANICAL ENGINEERING

MEC110: Kinematics of Machinery

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The lead screw of a lathe with nut forms a
 - a) Sliding pair
 - b) Rolling pair
 - c) Screw pair
 - d) Spherical pair
2. The mechanism forms a structure, when the number of degrees of freedom is equal to
 - a) Zero
 - b) One
 - c) Two
 - d) Three
3. The component of the acceleration perpendicular to the velocity is called
 - a) Normal component
 - b) Tangential component
 - c) Coriolis component
 - d) none of the above
4. When a slider moves on a fixed link having curved surface, their instantaneous centre lies
 - a) On their point of contact
 - b) At the centre of curvature
 - c) At the centre of circle
 - d) At the pin joint
5. The size of a cam depends upon
 - a) Base circle
 - b) Pitch circle
 - c) Prime circle
 - d) Pitch curve
6. For low and moderate speed engines, the cam follower should move with
 - a) Uniform velocity
 - b) simple harmonic motion
 - c) Uniform acceleration and retardation
 - d) cycloidal motion
7. Train value of a gear train is
 - a) equal to the speed ratio
 - b) half of the speed ratio
 - c) Reciprocal of the speed ratio
 - d) double the speed ratio

70 mm; DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, find 1. Angular velocities (magnitude and direction) of BC and CD; and 2. Angular acceleration of BC and CD.

(OR)

- b) In a slider crank mechanism, the length of crank OB and the connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The speed is 600 r.p.m. clockwise. When the crank has turned 45° from the inner dead centre position, determine 1. Velocity of the slider A, 2. Velocity of the point G, and 3. Angular velocity and acceleration of connecting rod AB.

23. a) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration during opening and closing of the valve each of which corresponds to 60° of cam rotation. The values must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20mm and its line of stroke passes through the axis of the cam.

(OR)

- b) A cam operating a Knife-edge follower has the following data:
- a) Follower moves outward through 40 mm during 60° of cam rotation.
 - b) Follower dwells for the next 45°
 - c) Follower returns to its original position during next 90°
 - d) Follower dwells for the rest of rotation.
 - e) The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50 mm. Draw the cam profile when the follower axis passes through the cam axis.

24. a) Two spur gears of 24 teeth and 36 teeth of 8 mm module and 20° pressure angle are in mesh. Addendum of each gear is 7.5mm. The teeth are of involute form. Determine: 1. The angle through which the pinion turns while any pair of

teeth are in contact and 2. The velocity of sliding between the teeth when the contact on the pinion is at a radius of 102mm. The speed of the pinion is 450 r.p.m.

(OR)

- b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D-E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.

25. a) A leather belt is required to transmit 7.5kw from a pulley 1.2 m in diameter, running at 250 rpm. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5MPa, density of leather 1Mg/m^3 and thickness of belt is 10 mm, determine the width of the belt taking centrifugal tension into account.

(OR)

- b) A dry single plate clutch is to be designed for an automotive vehicle whose engine is rated to give 100Kw at 2400rpm and maximum torque 500Nm. The outer radius of friction plate is 25% more than the inner radius and the pressure is not to exceed 0.07N/mm^2 . The coefficient of friction may be assumed to be 0.3. The helical springs required by this clutch to provide axial force necessary to engage the clutch is 8. If each spring has a stiffness equal to 40N/mm. Determine the initial compression in the springs and the dimensions of the friction plate.
