Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL /MAY 2012

Fourth Semester

MECHANICAL ENGINEERING

MEC110: Kinematics of Machinery

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. If a pair in motion has a line or point contact between the two elements is called a

   (a) Lower pair (b) sliding pair (c) higher pair (d) rolling pair

2. Slider mechanism is a example for

   (a) Indexing mechanism (b) reciprocating mechanism

   (c) quick return mechanism (d) reversing mechanism

3. The smallest circle drawn tangent to the pitch curve is known as the

   (a) Base circle (b) prime circle (c) pitch circle (d) pitch point

4. If the motion of the particles of a body moves along parallel circular arcs, it is called

   (a) Circular motion (b) curvilinear motion (c) translatory motion (d) angular motion

5. In a parabolic motion the maximum velocity is …….. times the mean velocity

   (a) 2 (b) 3 (c) 2.5 (d) 1.5

6. In low speed cam mechanisms with oscillating followers, the highest permissible value of the pressure angle is

   (a) 15° (b) 45° (c) 30° (d) 10°

7. The radial distance between the addendum and dedendum of a gear is called

   (a) Clearance (b) total depth (c) working depth (d) tooth space

8. Gears of same size connecting two shafts right angle to each other are known as

   (a) Mitre gears (b) zero bevel gears (c) rack and pinion (d) worm and worm wheel

9. The coefficient of friction of a 100N weighing body moves on a rough horizontal plane with a applied force of 60N is

   (a) 6 (b) 0.6 (c) 0.06 (d) 0.3

10. The velocity of the v-belt whose mass is 0.9 kg/m and maximum tension of 2.200 KN is

    (a) 29.454 m/s (b) 28.454 m/s (c) 29.545 m/s (d) 28.54m/s

PART B (10 x 2 = 20 Marks)

11. Define Degrees of Freedom.

12. State Grashoff’s law.

13. Write down the expression for Coriolis component of acceleration defining each of terms in the expression.
14. What are the various methods used for finding out velocity of mechanism?
15. What are the different motions of the follower?
16. Define dwell period.
17. Define circular pitch and diametral pitch in spur gear.
18. State methods to find the velocity ratio of epicyclic gear train.
19. Differentiate between angle of repose and limiting angle of friction.
20. What is meant be self locking in screw jack?

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain first inversion of Double Slider crank chain. (8)

(ii) Explain third inversion of double slider crank chain. (8)

(OR)

b) What is quick-return mechanism and with the help of a neat sketch explain the working of Whitworth quick return mechanism.

22. a) Derive the expression for Coriolis compenent of

(i) acceleration with neat sketch. (7)

(ii) Derive the expression for velocity and acceleration of piston in reciprocating steam engine mechanism. (7)

(OR)

b) The crank and connecting rod of a theoretical steam engine are a 0.5m and 2m long respectively. The crank makes 180 rpm in the clockwise direction. When it has turned 45° from the IDC position determine 1. Velocity of the piston 2. Angular velocity of connecting rod 3. Velocity of point ‘E’ on the connecting rod 1.5m from the gudgeon pin.

23. a) Draw the profile of a cam operating a Knife-edged follower from the following data: (a) Follower to move outward through 40 mm during 60° of a cam rotation; (b) Follower to dwell for the next 45° (c) Follower to return its original position during next 90° (d)Follower to dwell for the rest of cam rotation. 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 50mm. If the cam rotates at 300 r.p.m., determine the maximum velocity and acceleration of the follower during the outward stroke and return stroke.

(OR)

b) A tangent cam to drive a roller follower through a total lift of 12.5 mm for a cam rotation of 75°. The cam speed is 600 rpm. The distance between cam centre and follower centre at full lift is 45 mm and the roller is 20 mm in diameter. Find the cam proportions and plot displacement, velocity and acceleration for one full cycle.

24. a) (i) Two 20° involute spur gears have a module of 10 mm. The addendum is one module. The larger gear has 50 teeth and pinion has 13 teeth. Does the interference occur? If it occurs, to what value should the pressure angle be changed to eliminate interference? (7)

(ii) Two mating involute spur gears 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 rpm. The module pitch of the teeth is 12 mm. if the addendum on each wheel recess on each side are half the maximum possible length each, find (1) the addendum for pinion and gear wheel (2) the length of arc of contact (3 the maximum velocity of sliding during approach and recess. Assume pinion to be driver. (7)

(OR)

b) In a reverted epi cyclic gear train the arm A carries two grear (B & C) and a compound great(D.E). The gears B meshes with gear E and the gear ‘C’ meshes with gear D. The number of teech on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear ‘C’ when the gear B is fixed and the arm ‘A’ makes 100 rpm clockwise.

25. a) The mean diameter of the screw jack having pitch of 10 mm is 50 mm. A load of 20KN is lifted through a distance of 170 mm. Find the work done in lifting the load and efficiency of the screw jack when (i) the load rotates with the screw, and (ii) the load rests on the loose head which does not rotate with screw. The external and internal diameter of the bearing surface of the loose head is 60 mm and 10mm respectively. The coefficient of friction for the screw as well as the bearing surface may be taken as 0.08.

(OR)

b) An open belt running over two pulley of 1.5 m and 1.0 m diameters connects two parallel shafts 4.8 m apart. The initial tension in the belt is 3000 N. The smaller pulley is rotating at 600 rpm. The mass of belt is 0.6703 kg/m length. The coefficient of friction between the belt and pulleys is 0.3. Find (1) the exact length of the belt required (2) the power transmitted taking c.f tension into account.

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