Register Number: ……………………

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fourth semester

MECHANICAL ENGINEERING

MEC 110 Kinematics of Machinery

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

Answer ALL the Questions

PART A (10x1=10 Marks)

1.   A bolt and nut forms a

         a. Screw pair   b. Sliding and rolling

         c. Turning pair   d. Rolling

2.   Unconstrained rigid link in a plan is having following degrees of freedom

         a. 2   b. 3

         c. 4   d. 0

3.   A kinematic chain is known as a mechanism when

         a. No link is fixed   b. one link is fixed

         c. 2 link is fixed   d. 3 link is fixed

4.   The coriolis component of acceleration is taken into account for

         a. slider crank mechanism   b. four bar chain mechanism

         c. quick return motion   d. no motion

5.   The point on the cam with maximum pressure is called

         a. Pin point   b. pitch point

         c. trace point   d. high pressure point

6.   Offset is provided to a cam follower mechanism to

         a. avoid jerk   b. increase the jerk

         c. minimize the side thrust   d. decrease the jerk

7.   The type of gears used to connect two intersecting com planer shaft are

         a. straight bevel gears   b. spiral gears

         c. Screw gears   d. epicyclic

8.   In a clock, which gear type is used to connect minute and hour hand

         a. straight bevel gears   b. spiral and compound gears

c. epicyclic   d. reverted

9.   Multi plate cluch is used in

       a. two wheeler   c. flight

       b. simple cycle   d. rocket

10.   The angle of inclination of the plane , at which the body begins to move down the plane is called

       a. angle of friction   c. angle of repose

       b. angle of projection   d. angle of percussion

PART B (10x2=20 Marks)

11.   Distinguish between machine from structure.

12.   Write the Grubler's Equation and indicates its means.

13.   Write the explanation number of DOF and function of Scoth Yoke Mechanism.

14.   Distinguish Kinematic link from pair.

15.   Give equation for the maximum acceleration of the follower in SHM.

16.   List out various application of cam.

17.   Write the advantages of Epicyclical gear train.

18.   Compare the involutes and cycloidal gears.

19.   Give the types of tensions in belt drive.

20.   Classify the different types of clutch? Explain any one.

PART C (5x14=70 Marks)

21. a) How to find the time of cutting stroke and return stroke for following mechanism.

       i)   white worth quick return mechanism   (7)

       ii) ii) crank and slotted link mechanism.   (7)

(OR)

    b) Explain the function of beam engine and coupling rod of locomotive with neat sketch.

22. a) The crank and slider crank mechanism rotates clockwise direction at constant speed of 300rpm.The crank is 200mm and connecting rod is 800mm long. Determine

      1. Linear velocity and acceleration of the mid point of connecting rod

      2. Angular velocity and acceleration of the connecting rod, at a crank angle of 30° from IDC.

(OR)

b) PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ=62.5mm; QR=175mm; RS=112.5mm; and PS=200mm. The crank PQ rotates at 10rad/sec clockwise. Draw the velocity and acceleration diagram when angle QPS=60^0 and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS.

23. a) A cam, with a minimum radius of 50mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below:

      a. To move outwards through 40mm during 100^0 rotation of the cam.

      b. Dwell for next 80^0

      c. To return to its starting position during next 90^0

      d. To dwell for the rest of a revolution i.e. 90^0. Draw the profile of the cam when the line of stroke of the follower is off-set by 15mm.

      The displacement of the follower is to take place with uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 rpm and draw the displacement, velocity and acceleration diagrams for the one complete revolution of the cam.

(OR)

b) Derive the displacement, velocity and acceleration procedures for the following cam.

      1. When the roller contact is on circular nose in tangent cam.   (7)

      2. When the flat faced follower contact is on flank in circular arc cam.   (7)

24. a) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involutes with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.

(OR)

b) An epicyclical gear consists of three gears A, B and C. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C is carried an arm EF which rotates about the centre of A at 18 rpm. Sketch the arrangement if the gear A is fixed; determine the speed of gears B and C.

25. a) A belt drive consists of two V belts in parallel, on grooved pulleys of the same size. The angle of the groove is 30^0. The cross sectional area of each belt is 750mm^2 and coefficient of friction is 0.12. The density of belt material is 1.2 Kg/m^3 and the maximum safe stress in the material is 7 MPa. Calculate the power that can be transmitted between pulleys 300mm diameter rotating at 1500 rpm. Find also shaft speed at which the power transmitted would be maximum.

(OR)

b)   A multi plate cultch has three pairs of contact surfaces. The outer and inner radii of the contact surfaces are 100 mm and 50 mm respectively. The axial spring force is limited to 1kN.Assuming uniform wear, find the power transmitted at 1500rpm and coefficient of friction is 0.35.

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