JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
III.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOVEMBER, 2009
KINEMATICS OF MACHINERY
MECHANICAL ENGINEERING
(MECHATRONICS)

Time: 3hours   Max.Marks:80

Answer any FIVE questions
All questions carry equal marks

- - -

1.a] In a crank and slotted lever mechanism, the driving crank is 35 mm long, and the time ratio of cutting stroke to return stroke is 1.6. If the length of working stroke   of the ram is 110 mm, find the fixed centres and the slotted lever length.

  b] Distinguish between the crank and lever mechanism and coupled wheels   mechanism of locomotive as inversions of a four bar chain mechanism.   [8+8]

2.a] Sketch and explain the working of modified Scott-Russel straight line mechanism.
  b] Distinguish (by neat sketches) between Watt mechanism and Tchebicheff mechanism.
                                                                         [8 +8]

3.a] Derive the expression for the coriolis component of acceleration.
  b] How do you determine the direction of coriolis component of acceleration?

                                                                         [12+4]

4. Two inclined shafts are connected by means of a Universal joint. The speed of the driving shaft is 1000 rpm. 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 will this occur?   [16]

5. A cam rotating clockwise at a uniform speed of 200rpm is required to move an   offset roller follower with a uniform and equal acceleration and retardation on   both the outward and return strokes. The angle of ascent and the angle of dwell   and   the angle of the descent is 120^0, 60^0, 90^0 resp. The follower dwells for the rest   of the cam rotation. The least radius of the cam is 50mm, the lift of the follower is 25mm and the diameter of the roller is 10mm. The line of stroke of the follower is offset by 20mm from the axes of the cam. Draw the cam profile and maximum   velocity and the acceleration of the follower during the outstroke.   [16]

6.a] Explain the following terminology of crown gears
i)axial pitch, ii)lead, iii) lead angle.

b] A gear wheel having 20 involute teeth of 1.25 circular pitch is to be generated by means of straight rack cutter. The addendum of the cutter and of wheel is 0.4cm. What is the smallest pressure angle which may be employed, if undercutting is avoided? Calculate from first principles, the length of arc of contact when two such wheels, each of 20 teeth mesh together correctly. [6+10]

7.a] What are the advantages and disadvantages of crossed belts over open belts?

b] A rough rule for leather is that the effective tension should not exceed $8N/mm^2$ of width for a belt 5 mm thick, if the rule is applied under following conditions ;
What is the maximum stress on the tight side of the belt? Angle of lap 160^0. Coefficient of friction 0.3. Belt speed 15 m/s, density of the leather: $1150 kg/m^3$. [8+8]

8.a] What is compound epicyclical gear train?

b] In a reverted epicyclical 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 rpm clockwise. [4+12]

****