24170

B. Tech 4th Sem. (Mechanical Engg.)

Examination – May, 2012

KINEMATICS OF MACHINE

Paper : ME - 204 - F

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

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complain in this regard, will be entertained after examination.

Note : Question No. **1** is *compulsory*. Attempt *five* questions in total at least *one* question from each Section.

1. (a) Differentiate between a machine and a mechanism.

   (b) How will you find the direction of Coriolis component of acceleration ?

   (c) Define statics and kinetic friction.

   (d) Distinguish between slip and creep in belt drive.

   (e) What is function of differential gear in an automobile ?

(f) Explain the fundamental Law of gearing.

(g) What is crowning of pulleys ?

(h) What do you mean by structural error ?

(i) Name the different motions that a follower can have.

(j) Differentiate between cam angle and pressure angle. $2 \times 10 = 20$

SECTION – A

2. What do you mean by inversion of a mechanism ? Explain with sketches all the inversions of single slider crank mechanism. Where these inversions are used ? 20

3. The crank of a slider crank mechanism is 15 cm and the connecting rod is 60 cm long. The crank makes 300 rpm in the clockwise direction. When it has turned 45° from inner dead centre position, Determine : 20

   (i) Acceleration of the midpoint of connecting rod,

   (ii) Angular acceleration of the connecting rod.

SECTION – B

4. A symmetrical tangent cam with a least radius of 25 mm operates a roller follower of radius 10 mm. The angle of ascent is 60° and total lift is 15 mm. If the speed of the cam is 400 rpm, then calculate :

(i) The principal dimensions of the cam.

(ii) The acceleration of the follower at the beginning of lift, where the roller just touches the nose and at the apex of circular nose. Assume there is no dwell between ascent and decent.   20

5. Two gear wheels mesh externally and are to give a velocity ratio of 4 :1. The teeth are of involutes form; module = 6 mm, addendum = one module, pressure angle 20°. The pinion rotates at 90 rpm. Find :   20

(i) Number of teeth on pinion to avoid interference on it and the corresponding number on the wheel.

(ii) The length of path and arc of contact.

(iii) The number of pairs of teeth in contact.

(iv) The maximum velocity of sliding.

SECTION – C

6. Determine the Chebyshev spacing for a four bar linkage generating the function y- sin x , in the range of $0 \leq x \leq \pi/2$ where three precision points are to be prescribed. For the ranges of input and output link rotations of $\Delta \Phi = 60°$ and $\Delta \Psi = 90°$ respectively, find ϕ_2, ϕ_3, Ψ_4.   20

7. Describe the procedure of calculating the fixing torque in case of fixed wheel in case of an epicyclic gear train. **20**

SECTION – D

8. The external radius of a friction plate of a single clutch having both side as effective, is 150 mm . The power transmitted is 20 KW at a speed of 1000 rpm. The maximum intensity of pressure at any point of contact surface is 0.8×10^5 N/m^2. If the coefficient of friction is 0.35, then find : **20**

   (i)   The internal radius of friction plate,

   (ii) Axial thrust with which the friction surfaces are held together.

9. A shaft which rotates at a constant speed of 160 rpm is connected by belting to a parallel shaft 180 cm apart, which has to run at 60, 80, and 100 rpm. The smallest pulley on the driver shaft is 15 cm in radius. Determine the remaining radii of the two stepped pulleys for : **20**

   (a) a crossed belt,

   (b) an open belt. Neglect belt thickness and slip.