24170

B. Tech. 4th Semester (ME) F. Scheme
Examination, May–2014
KINEMATICS OF MACHINE
Paper–ME–204-F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt **five** questions in total at least **one** question from each section. All questions carry equal marks.*

1. Explain the following : 5×4

(a) Degree of freedom and equivalent mechanism

(b) Law of gearing

(c) Chebychev spacing

(d) Friction in journal bearing

Section–A

2. (a) Define Grashof's law. State how is it useful in classifying the four-link mechanism into different types. 10

(b) How are the kinematic pairs classified ? Explain with examples. 10

3. (a) In a slider crank mechanism, the stroke of the slider is one half of the length of the connecting rod. Draw a diagram to give the velocity of the slider at the instant assuming the crank shaft to turn uniformly. 10

(b) What are centripetal and tangential components of acceleration ? When do they occur ? How are they determined ? 10

Section–B

4. The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent. Minimum radius of cam = 25mm, Roller diameter = 7.5mm, Lift = 28 mm, Offset of follower axis = 12mm towards right, Angle of ascent = 60°, Angle of dwell between ascent and descent = 45°, speed of the cam = 200 rpm. Draw the profile of the cam and determine the maximum velocity and the uniform acceleration of the follower during the outstroke and the return stroke. 20

5. Two 20° gears have a module pitch of 4mm. The no. of teeth on gears 1 and 2 are 40 and 24 respectively. If the gear 2 rotates at 600 rpm, determine the velocity of sliding when the contact is at the tip of the tooth of gear 2. Take addendum equal to one module. Also find the maximum velocity of sliding. 20

Section–C

6. An epicyclic gear consists of a pinion, a wheel of 40 teeth and an annulus with 84 internal teeth concentric with wheel. The pinion gears with the wheel and the annulus. The arm that carries the axis of the pinion rotates at 100 rpm. If the annulus is fixed, find the speed of wheel, if wheels fixed, find the speed of annulus. 20

7. Design a four link mechanism when the motions of the input and the output links are governed by a function $y=2 \log_{10} x$ and x varies from 2 to 4 with an interval of 1. Assume θ to vary from 30° to 70° and $\varnothing$ from 40° to 100°. 20

Section–D

8. (a) A cone clutch with a semi – cone angle of 150 transmits 10kW at 600 rpm. The normal pressure intensity between the surfaces in contact is not to exceed 100 KN/m^2. The width of the friction surface is half of the mean diameter. Assume $\mu=0.25$. determine :

   (i) The outer and inner diameters of the plate.

   (ii) Width of the cone face.

   (iii) The axial force to engage the clutch. 10

   (b) Describe the working of a Mitchell thrust bearing. 10

9. (a) The following data relate to a rope drive :

Power transmitted = 20KW, Diameter of pulley = 480mm, Speed = 80rpm, angle of lap on smaller pulley = 160°, number of ropes = 8, mass of rope/m length = $48G^2$ kg, limiting working tension = $132G^2$ KN, coeff. of friction = 0.3, angle of groove = 44°, If G is girth of rope in m, determine the initial tension and diameter of each rope. 10

(b) What are the different types of pulleys ? Explain. 10