



Reg. No. :

Name :

**Fifth Semester B.Tech. Degree Examination, February 2018
(2008 Scheme)**

08.503 : THEORY OF MACHINES (MP)

Time : 3 Hours

Max. Marks : 100

Instructions : Answer *all* questions from Part – A and *any one full* question from *each* Module of Part – B.

PART – A

1. State and prove Kennedy's theorem of three centers.
2. With a neat sketch, explain the working of a ratchet and pawl mechanism.
3. Differentiate between higher pair and lower pair with examples.
4. With the help of a neat sketch, locate the instantaneous centers of a four bar mechanism.
5. Differentiate between a tangent cam and a circular arc cam, using sketches.
6. Explain different types of kinematic pairs with sketches.
7. With sketches explain four different types of cam followers used.
8. Derive an expression to find the Coriolis component of acceleration.
9. State and prove law of gearing.
10. Mark the following terms on a sketch, showing two spur gears in action :
 - a) Pressure angle
 - b) Line of action
 - c) Path of contact
 - d) Angle of action.

(10×4=40 Marks)

**PART – B
Module – I**

11. a) With neat sketches, explain the inversions of a double slider crank chain. **10**
b) Derive the fundamental steering equation. With the help of a sketch, find the condition for correct steering in a Davis steering gear mechanism. **10**

OR

P.T.O.



12. Synthesise a four bar mechanism using Freudenstein's equation to generate the function $y = x^2$, for the interval $1 \leq x \leq 5$. The input crank moves from 20° to 120° , whereas the output crank moves from 0° to 90° . Use three accuracy points. 20

Module – II

13. a) Derive an expression for finding the ratio of friction tension of a V belt. 5
 b) A rope drive has the following specifications.
 Angle of lap = 150° , Power transmitted = 100 kW, Diameter of pulley = 1.2 m, groove angle of pulley = 40° , Mass of each rope = 0.05 kg/m. If the rope can take a safe pull of 100 N, find out the initial rope tension and the number of ropes required, taking into account centrifugal tension. Friction coefficient is 0.25. 15

OR

14. a) Derive the equation for finding the friction torque of a conical collar using : 10
 a) uniform pressure theory and
 b) uniform wear theory.
 b) A single plate clutch with both sides active, transmits a power of 15 kW with developed maximum torque of 150 N.m. Axial pressure has a limit of 120 kN/m^2 . The ratio of outer to inner diameter of the plate is 1.5. Assuming uniform wear and a coefficient of friction of 0.3, determine the inner and outer diameter of the plate and axial force exerted by the springs. 10

Module – III

15. For two externally meshing gears, velocity ratio is 4 and the pressure angle is 25° . The pinion has rpm of 100. If the addendum is 1 module and the module is 4 mm, find the number of pairs of teeth in contact and the minimum number of teeth in each gear to avoid interference. 20

OR

16. Draw the profile of a cam, where the follower moves with simple harmonic motion during ascent and moves with uniform acceleration and deceleration during descent. Uniform acceleration is $3/4$ of uniform deceleration. Minimum radius of cam = 30 mm, Roller radius = 10 mm, Lift = 25 mm, Offset of follower axis = 15 mm towards right, Angle of ascent = 80° , Angle of descent = 110° , Angle of dwell between ascent and descent = 60° . If the cam has a speed of 300 rpm, calculate maximum velocity and acceleration during ascent and descent. 20

(3×20=60 Marks)