

Code: ME4T4, AE4T4

**II B.Tech - II Semester – Regular/Supplementary Examinations –
April 2018**

**KINEMATICS OF MACHINERY
(Common for ME, AE)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

$$11 \times 2 = 22$$

1.

- a) What is a machine? Giving example, differentiate between a machine and a structure.
- b) Explain different kinds of kinematic pairs giving example for each one of them.
- c) What is Kutzbach's criterion for plane mechanisms?
- d) State Aronhold Kennedy's theorem of three instantaneous centres.
- e) What do you mean by Coriolis component of acceleration? Briefly explain.
- f) Define the term 'rubbing velocity' at a pin joint in mechanisms.
- g) Write an expression for the ratio of shafts velocities for Hooke's joint.
- h) Why a roller follower is preferred to that of a knife-edged follower in cam mechanisms?

- i) What are the different types of motion with which a follower can move on the surface of cams?
- j) Explain the terms: i) Module, and ii) Pressure angle, related to gears.
- k) Write the expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel.

PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. Enumerate the inversions of the single slider crank chain.
Explain each of them with their applications. 16 M
3. The crank and connecting rod of a horizontal steam engine are 0.5m and 2m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45^0 from the inner dead center position. Determine (i) Velocity and Acceleration of the Piston (ii) Angular velocity and angular acceleration of the connecting rod (iii) Velocity of rubbing at the pins of the crank shaft, crank and cross-head, when the diameters of their pins are 5 cm, 3 cm, 6 cm respectively. 16 M
4. a) Explain Tchebicheff's and Roberts straight line motion mechanisms with neat sketches. 8 M

b) A Hooke's joint connects two shafts whose axes intersect at 25^0 . What will be the angle turned by the driving shaft when

- i) The velocity ratio is maximum, minimum, unity
- ii) Acceleration of the driven shaft is maximum, minimum (negative) and zero.

8 M

5. A cam with 30mm as minimum diameter is rotating clockwise with a uniform speed of 1200 r.p.m. has to give following motion to the roller follower (10mm diameter):

- a) Follower to move outward through a distance of 25mm during 120^0 of cam rotation with uniform acceleration and retardation
- b) Follower to dwell for 60^0 cam rotation
- c) Follower to return to its initial position during 90^0 of cam rotation with uniform acceleration and retardation
- d) Follower to dwell for rest of the cam rotation

Draw the cam profile if the axis of the roller-follower passes through the axis of the cam. Determine the maximum velocity of the follower during the outward and return stroke.

16 M

6. a) Two mating involute spur gears with module pitch of 10mm have 20 teeth on the pinion and 40 teeth on the gear wheel of 20^0 pressure angle, the addendum is equal to the module. Does interference occur between gears? 7 M

b) A compound gear train consists of four gears. The number of teeth on the gears A,B,C,D are 54, 75, 36 and 81 respectively. Gears B and C constitute a compound gear. Determine the torque on the output shaft if the gear A transmits 9 kW at 200 rpm and the train efficiency is 80%.

9 M