

B.E DEGREE EXAMINATIONS: APRIL/MAY 2013

Fourth Semester

MECHANICAL ENGINEERING

MEC110: Kinematics of Machinery

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A kinematic chain is known as a mechanism when
 - a) None of the links is fixed
 - b) One of the links is fixed
 - c) All of the links is fixed
 - d) Two of the links is fixed
2. In a four bar chain
 - a) Each of the four pairs is a turning pair
 - b) One is a turning pair, other are sliding pairs
 - c) Three are turning pairs and one is sliding pair
 - d) Each of the four pairs is a sliding pair.
3. The acceleration component, parallel to the velocity of the particle, at the given instant is called
 - a) Radial component
 - b) Tangential component
 - c) Coriolis component
 - d) None of these
4. The coriolis component of acceleration is taken into account for
 - a) Slider crank mechanism
 - b) Four bar chain mechanism
 - c) Quick return motion mechanism
 - d) None of these
5. The cam follower extensively used in air-craft engines is
 - a) Knife edge follower
 - b) Flat faced follower
 - c) Spherical faced follower
 - d) Roller edge follower
6. For high speed engines, the cam follower should move with
 - a) Uniform velocity motion
 - b) Simple harmonic motion
 - c) Uniform acceleration and retardation
 - d) Cycloidal motion
7. The train value of a gear train is
 - a) Equal to velocity ratio of a gear train
 - b) Reciprocal of velocity ratio of a gear train
 - c) Always greater than unity
 - d) Always less than unity
8. In a clock mechanism the train gear used to connect minute hand to hour hand is
 - a) Epicyclic gear train
 - b) Reverted gear train
 - c) Compound gear train
 - d) Simple gear train
9. The angle of inclination of the plane, at which the body begins to move down the plane, is
 - a) Angle of friction
 - b) Angle of repose

the linear velocity and acceleration of the midpoint of the connecting rod. Also determine the angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead center position.

23. a) A cam rotating clockwise at a uniform speed of 1000 r.p.m is required to give a roller follower the motion defined below :
1. Follower to move outwards through 50mm during 120° of cam rotation.
 2. Follower to dwell for next 60° of cam rotation.
 3. Follower to return to its standing position during next 90° of cam rotation.
 4. Follower to dwell for the next of the cam rotation
- The minimum radius of the cam is 50 mm and the diameter of roller is 10 mm. The line of stroke of the follower is offset by 20 mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation of both the outward and return stroke, draw profile of the cam and find the maximum velocity and acceleration during outstroke and return stroke.

(OR)

- b) Draw the profile of the cam when the roller follower moves with cycloid motion during outstroke and return stroke as given below:
- (i) Out stroke with max displacement of 31.4 mm during 180° of cam rotation.
 - (ii) Return stroke for the next 150° of cam rotations.
 - (iii) Dwell for the remaining 30° of cam rotation min radius of the cam is 15mm and roller diameter of follower is 10mm.
- Draw the profile for Radial type and offset type.

24. a) In a reverted gear train, two shafts A and B are in the straight line and are geared through an intermediate parallel shaft C. The gears connecting A and C have a module of 2 and those connecting C and B have a module of 3.5. Speed of B is less than $1/10$ that of A. If two pinions have each 24 teeth, find suitable teeth for gears, the actual velocity ratio and corresponding distance of shaft C from A.

(OR)

- b) In an Epicyclic gear of the sun and planet type, the pitch circle diameter of the internally toothed ring 'D' is to be 224 mm and the module 4 mm. When the ring 'D' is stationary, the spider 'A' which carries the three planet wheels 'C' of equal size, is to make one revolution in the same sense as the sun wheel 'B' for every five revolutions of the driving spindle carrying the sun wheel 'B'. Determine the suitable number of teeth for all the wheels.

25. a) Explain with neat sketch the working of centrifugal clutch. Deduce the expression for the total torque transmitted.

(OR)

- b) A band and block brake, having 14 blocks each of which subtends an angle of 15° at the centre, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum, find: 1. Maximum braking torque, 2. Angular retardation of the drum, and 3. Time taken by the system to come rest from the rated speed of 60 r.p.m. The coefficient of friction between blocks and drum may be taken as 0.25.
