

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2019 - 20 Examination

Semester: 3
Subject Code: 203109207
Subject Name: Kinematics and Theory of Machines

Date:02/12/2019
Time:02:00 pm to 04:30 pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Answer the following Questions -**(15)**

1. Which of the following is an inversion of single slider crank chain mechanism?
(A) Beam engine (B) Watt's indicator mechanism (C) Elliptical trammels (D) Rotary engine
2. The instantaneous centres which vary with the configuration of the mechanism, are called as _____
3. A material used for lining of friction surfaces of a clutch should have _____ coefficient of friction.
4. A point B on a rigid link AB moves with respect to A with angular velocity ω rad/s. The total acceleration of B with respect to A will be equal to
(A) Vector sum of radial component and coriolis component
(B) Vector sum of tangential component and coriolis component
(C) Vector sum of radial component and tangential component
(D) Vector difference of radial component and tangential component
5. _____ mechanism is used to enlarge or reduce the size of a drawing?
6. Law of gearing is satisfied if
(A) Two surfaces slide smoothly
(B) Common normal at the point of contact passes through the pitch point on the line joining the centres of rotation
(C) Number of teeth = P.C.D / Module
(D) Addendum is greater than dedendum
7. _____ follower extensively used in air-craft engine is
8. A differential gear in an automobile is a
(A) Epicyclic gear train (B) Simple gear train (C) Compound gear train (D) none of these
9. Gyroscopic effect is not observed in which of the following actions performed by the ships?
(A) Rolling (B) Pitching (C) Steering (D) All of the above
10. The function of governor is to _____ the speed of engine.
11. What is the function of Bearing?
12. What are Lower pair and Higher pair?
13. What is the function of brake?
14. What is rubbing velocity?
15. What do you mean by 6*37 ropes?

Q.2 Answer the following questions. (Attempt any three)**(15)**

- A) Explain degree of freedom with neat sketch. Also explain Kutzbach criterion
- B) Differentiate between watt and porter governor.
- C) Explain the following terms:
 1. Function generation
 2. Path generation
 3. Body Guidance or motion generation
- D) Explain Length of path of contact with neat sketch.

- Q.3** A) The crank and connecting rod of a theoretical steam engine are 0.5 m and 2m long respectively. (07)
The crank makes 180 rpm in the clockwise direction. When it has turned 45° from the inner dead centre position, determine:
- a) Velocity of piston,
 - b) Angular velocity of connecting rod,
 - c) Velocity of point E on the connecting rod 1.5m from the gudgeon pin,
 - d) Velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50mm, 60mm, and 30mm respectively.
 - e) Position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft.

B) What is straight line motion mechanism? Explain Peaucellier mechanism with neat sketch. (08)

OR

B) A pair 20° involute gear has module of 5 mm. The pinion has 20 & gear has 40 teeth. Addendum on the pinion & gear wheel in terms of module is one. Find out: (1) Contact Ratio (2) Length of path of contact (3) Length of arc of contact (4) Angle turned through by pinion (5) Angle turned through by wheel. (08)

Q.4 A) Explain single plate clutch with neat sketch. (07)

OR

A) What is a brake? Enlist the various types of brakes and explain the working of any one of them with neat sketch. (07)

B) A cam, with a minimum radius of 50mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as describe below: (08)

1. To move outwards through 40mm during 100° rotation of the cam
2. To dwell for next 80° .
3. To return to its starting position during next 90° .
4. To dwell for the rest period of a revolution i.e. 90° .

Draw the profile of the cam.

The displacement of the follower is to take place with uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration diagram for one complete revolution of the cam.

Draw the displacement, velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m.