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August/September 2022
B.Tech. (ME) Re-Appear IV SEMESTER
Kinematics of Machines (ME-202C)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

4. *Drawing sheets are required for solving the questions*

PART-A

1. (a) What do you mean by constrained motion?   (1.5)

     (b) What is Machine?   (1.5)

     (c) What is lower pair?   (1.5)

     (d) What are the uses of Pantograph?   (1.5)

     (e) Name the different mechanism which are used for exact straight-line motion.   (1.5)

     (f) Define the term 'Length of arc of contact'.   (1.5)

(g) What do you mean by interference between two mating gears? (1.5)

(h) Differentiate between Base circle and Prime circle. (1.5)

(i) What is difference between Brakes and Dynamometer? (1.5)

(j) What are Accuracy points? (1.5)

PART-B

2. What do you mean by Inversion of a mechanism? Explain with sketches all the inversions of single slider crank mechanism. Where these inversions are used? (15)

3. Draw the profile of a cam operating a knife edge follower when axis of the follower passes through the axis of the cam shaft from the following data: -

   (i) Follower to move outwards through 30 mm during 90 degree of cam rotation.

   (ii) Follower to dwell for next 45 degree.

   (iii) Follower to return its original position during next 60 degree.

   (iv) Follower to dwell for rest of cam rotation.

   The displacement of the follower is to take place with simple harmonic motion during both the outward and return stroke. The least radius of cam is 50 mm. if cam rotates 600 rpm., determine the maximum velocity and acceleration of the follower during outwards stroke and return stroke. (15)

4. State and prove the law of gear tooth action for constant velocity ratio and show how the involute teeth profile satisfies the condition. (15)

5. Design a slider crank mechanism so that displacement of slider is proportional to cube of the crank rotation in the interval of $30^0 \le \theta \le 100^0$. Assume initial distance of slider equal to 15 cm and final distance to be 10 cm. (15)

6. (a) Describe with the neat sketch the construction and working of rope brake dynamometer. (10)

   (b) What do you understand by self-locking of brake and self-energized brake? (5)

7. The crank of slider crank mechanism is 150 mm and connecting rod is 750 mm. The crank rotates at a constant speed of 300 r.p.m. clockwise. Calculate the velocity and acceleration of slider when crank has turned 30 degrees from inner dead centre. (15)