Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2011 & Onward) (Sem.–3)

KINEMATICS OF MACHINES

Subject Code : BTAR-305

M.Code : 63005

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a. What is the difference between kinematic pair and kinematic chain?

b. Explain the terms: lower pair and higher pair.

c. Define the degree of freedom in case of mechanism.

d. What is the difference between normal and tangential acceleration?

e. Discuss the different types of instantaneous centres for a mechanism.

f. Define the terms: circular pitch and diametral pitch.

g. What do you mean by static and dynamic balancing?

h. What is the difference between simple and compound gear train?

i. Name the different types of dynamic forces in a mechanism.

j. What is spatial mechanism?

SECTION-B

2. Sketch and explain the various inversions of a slider crank chain.

3. Locate all the instantaneous centres for a four bar mechanism. The lengths of various links are : AD = 125 mm; AB = 62.5 mm; BC = CD = 75 mm. If the link AB rotates at a uniform speed of 10 *r.p.m.* in the clockwise direction, find the angular velocity of the links BC and CD.

4. Derive an expression for the magnitude and direction of coriolis component of acceleration.

5. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 *r.p.m.* in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed and makes 300 *r.p.m.* in the clockwise direction, what will be the speed of gear B?

6. If the crank and the connecting rod are 300 mm and 1 m long respectively and the crank rotates at a constant speed of 200 *r.p.m.*, determine:

   a. The crank angle at which the maximum velocity occurs

   b. Maximum velocity of the piston.

SECTION-C

7. Explain the following :

   a. Mass moment of inertia; laws of motion.

   b. Types of constrained motion.

   c. Types of kinematic pair.

8. Four masses A, B, C and D are attached to a shaft and revolve in the same plane. The masses are 12 kg, 10 kg, 18 kg and 15 kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm and 30 mm. The angular position of the masses B, C and D are 60°, 135° and 270° from the mass A. Find the magnitude and position of the balancing mass at a radius of 100 mm.

9. A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.