Roll No. | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 18

B.Tech. (Automation & Robotics) (2012 & 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

Write briefly :

1. What is the degree of freedom of a mechanism? How is it determined?
2. What do you mean by the term ‘Coincident Points’?
3. What are centripetal and tangential component of acceleration?
4. Explain the terms : (i) Module, (ii) Pressure angle.
5. Explain briefly the differences between simple, compound, and epicyclic gear trains.
6. Define spatial mechanism.
7. State D’Alembert’s principle.
8. Write the various necessary conditions for an equivalent dynamical system.
9. Discuss the advantages and applications of cycloidal tooth profile.
10. Write the Acceleration equation of the reciprocating mass of a slider crank mechanism.

SECTION-B

11. How are the Whitworth quick return mechanism and crank and slotted-lever mechanism different from each other?

12. The position of a point is given by the equation $R=100e^{j2\pi t}$. What is the path of the point? Determine the displacement of the point from $t = 0.10$ to $t = 0.40$.

13. Draw the acceleration diagram of a slider crank mechanism.

14. A vertical double acting steam engine has a cylinder 300 mm diameter and 450 mm stroke and runs at 200 r.p.m. The reciprocating parts has a mass of 225 kg and the piston rod is 50 mm diameter. The connecting rod is 1.2 m long. When the crank has turned through 125° from the top dead centre, the steam pressure above the piston is 30 kN/m^2 and below the piston is 1.5 kN/m^2. Calculate the effective turning moment on the crank shaft.

15. A pair of gears, having 40 and 30 teeth respectively are of 25° involute form. The addendum length is 5 mm and the module pitch is 2.5 mm. If the smaller wheel is the driver and rotates at 1500 r.p.m., find the velocity of sliding at the point of engagement and at the point of disengagement.

SECTION-C

16. A mechanism, as shown in Fig.1, has the following dimensions: OA = 200mm; AB = 1.5m; BC = 600mm; CD = 500mm and BE = 400mm. Locate all the instantaneous centres. If crank OA rotates uniformly at 120 r.p.m. clockwise, find

a) The velocity of B, C and D,

b) The angular velocity of the links AB, BC and CD.

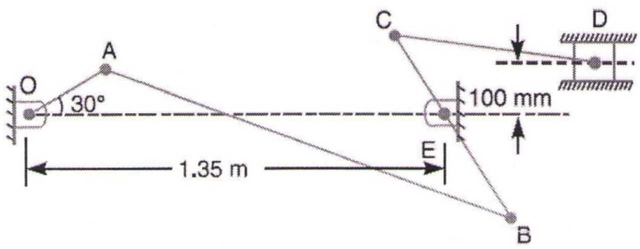

Fig. 1

17. An epicyclic gear consists of three gears A, B and C as shown in Fig. 2. The gear A has 92 internal teeth and gear C has 52 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m. If the gear A is fixed, determine the speed of gears B and C.

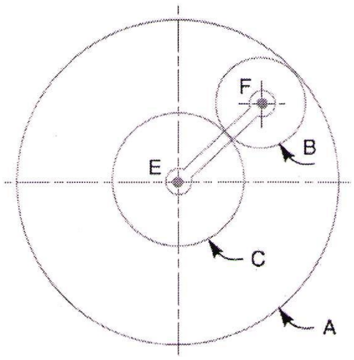

Fig. 2

18. Write notes on :

    a) Robotic Mechanisms

    b) Static balancing

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