Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (Automation & Robotics) (2018 Batch)   (Sem.–3)
KINEMATICS AND THEORY OF MACHINES
Subject Code : BTAR-305-18
M.Code : 76504

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. Differentiate between flexible link and fluid link.

2. Differentiate between lower pair and higher pair.

3. What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples.

4. State the 'Aronhold Kennedy's Theorem' of three instantaneous centres.

5. What is the Coriolis acceleration component?

6. Why a roller follower is preferred to that of a knife-edged follower?

7. Explain the terms :

   a) Module

   b) Pressure angle

8. Differentiate between epi-cycloid and hypo-cycloid.

9. What do you understand by Laws of friction?

10. Explain transmission angle of a mechanism.

SECTION-B

11. A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of rotation of the crank. The radius of the crank is 120 mm. Find the ratio of the time of cutting to the time of return stroke.

12. Using relative velocity approach find the velocity of point D in Fig. 1, $\omega_2 = 20$ rad/sec.

    $O_2O_4 = 350$ mm, BD = 160 mm

    $O_2B = 140$ mm, CD = 100 mm
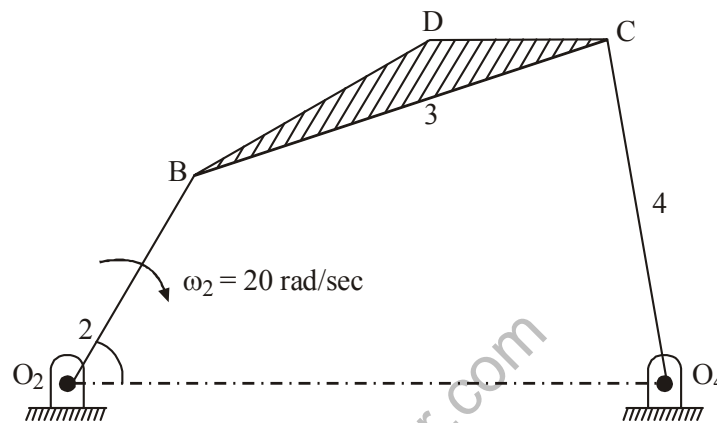
    BC = 250 mm, $O_4C = 210$ mm

FIG.I

13. Derive an expression for minimum number of teeth required on a pinion to avoid interference when it gears with a rack.

14. Find the force required to move a load of 300 N up a rough plane, the force being applied parallel to the plane. The inclination of the plane is such that a force of 60 N inclined at 30° to a similar smooth plane would keep the same load in equilibrium. The coefficient of friction is 0.3.

15. Explain the following :

    a) Angle of friction.

    b) Coefficient of friction.

SECTION-C

16. A cam drives a flat reciprocating follower in the following manner :

   During first 120° rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam.

17. An Epicyclic gear train, as shown in Fig. 2, has a sun wheel S of 30 teeth and two planet wheels P-P of 50 teeth. The planet wheels mesh with the internal teeth of a fixed annulus A. The driving shaft carrying the sunwheel, transmits 4 kW at 300 r.p.m. The driven shaft is connected to an arm which carries the planet wheels. Determine the speed of the driven shaft and the torque transmitted, if the overall efficiency is 95%.
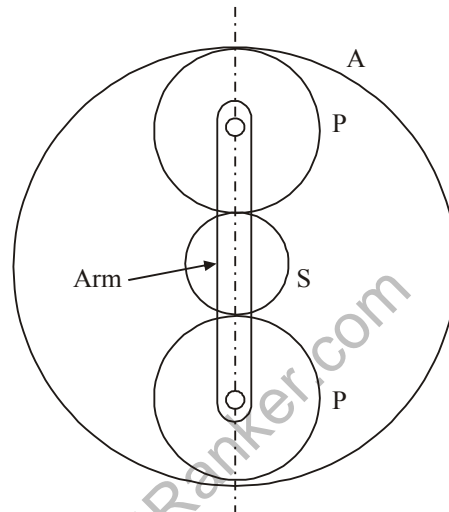
FIG.2

18. Write notes on :

   a) Acceleration in the Slider Crank Mechanism

   b) Kinematic Chain

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.