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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. What is the difference between lower pair and higher pair? Give example of each.
2. Explain Kennedy's theorem of instantaneous centres.
3. What do you mean by engine indicator? Explain with help of suitable diagram.
4. Differentiate between radial and tangential component.
5. Why a roller follower is preferred to that of a knife-edged follower?
6. Which motion of follower is preferred for high speed engines and why?
7. Name the clutch which is used in cars and trucks.
8. Differentiate between sliding and rolling friction.
9. Explain law of gearing.
10. Differentiate between epi-cycloid and hypo-cycloid teeth.

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SECTION-B

11. Show that slider crank mechanism is a modification of the basic four bar mechanism.

12. In a slider crank mechanism, the length of crank *OB* and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity *G* of the connecting rod is 275 mm from the slider *A*. The crank speed is 600 r.p.m. clockwise. When the crank has turned 45° from the inner dead centre position, determine :

    a) Velocity of the slider *A*,

    b) Velocity of the point *G* and

    c) Angular velocity of the connecting rod *AB*.

13. Draw the displacement, velocity and acceleration diagrams for a follower when it moves with simple harmonic motion. Derive the expression for velocity and acceleration during outstroke and return stroke of the follower.

14. A single plate clutch, with both sides effective, has outer and inner diameters 600 mm and 400 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2. If the coefficient of friction is 0.2, determine the power transmitted by a clutch at a speed 3700 r.p.m.

15. State the laws of (a) Dynamic friction, and (b) Fluid friction.

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SECTION-C

16. A disc cam rotating in a clockwise direction is used to move a reciprocating roller with simple harmonic motion in a radial path, as given below :

    a) Outstroke with maximum displacement of 25 mm during 120° of cam rotation.

    b) Dwell for 60° of cam rotation.

    c) Return stroke with maximum displacement of 25 mm during 90° of cam rotation.

    d) Dwell during remaining 90° of cam rotation.

    The line of reciprocation of follower passes through the camshaft axis. The maximum radius of cam is 20 mm. If the cam rotates at a uniform speed of 300 r.p.m. Find the maximum velocity and acceleration during outstroke and return stroke. The roller diameter is 8 mm. Draw the profile of the cam when the line of reciprocation of the follower is offset by 20 mm towards right from the cam shaft axis.

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17. A compound epicyclic gear is shown diagrammatically in Fig. 1. The gears *A*, *D* and *E* are free to rotate on the axis *P*. The compound gear *B* and *C* rotate together on the axis *Q* at the end of arm F. All the gears have equal pitch. The number of external teeth on the gears *A*, *B* and *C* are 18, 45 and 21 respectively. The gears *D* and *E* are annular gears. The gear *A* rotates at 100 r.p.m. in the anticlockwise direction and the gear *D* rotates at 450 r.p.m. clockwise. Find the speed and direction of the arm and the gear *E*.

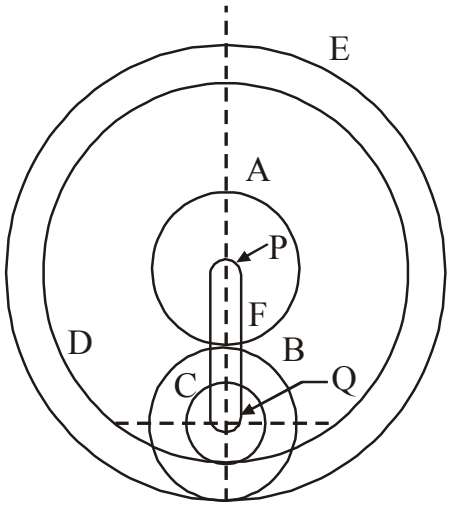


FIG.1

18. Write notes on :

    a) Coriolis component of acceleration

    b) Grashof's law

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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.

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