A   Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code:U4701

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Mechanical Engineering

21UME401–KINMEATICS OF MACHINERY

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In a reciprocating steam engine, which of the following forms a   CO1-U
    kinematic link ?

    (a) cylinder and piston   (b) piston rod and connecting rod

    (c) crank shaft and flywheel   (d)flywheel and engine frame

2. The method of obtaining different mechanisms by fixing in turn   CO1-U
    different links in a kinematic chain, is known as

    (a) structure   (b) machine   (c) inversion   (d) compound mechanism

3. The relative velocity of B with respect to A in a rigid link AB is   CO1-U

    (a) parallel to AB   (b) perpendicular to AB   (c)along AB   (d) at 45°

4. In Pin Joint the links A and B turns in opposite direction, then the   CO1-U
    rubbing velocity at the pin joint O is

    (a) $\omega_1.\omega_2$ (b)$(\omega_1-\omega_2)r$ (c)$(\omega_1+\omega_2)r$ (d) $(\omega_1-\omega_2)2r$

5. Cam size depends upon   CO1-U

    (a) base circle   (b)pitch circle

    (c) spherical faced follower   (d) roller follower

6. Offset is provided to a cam follower mechanism to   CO1-U

    (a) minimise the side thrust   (b) accelerate

    (c) avoid jerk   (d) none of the mentioned

7. An imaginary circle which by pure rolling action, gives the same motion as the actual gear, is called   CO1-U

   (a) addendum circle   (b) dedendum circle   (c)pitch circle   (d) clearance circle

8. The type of gears used to connect two non-parallel non-intersecting shafts are   CO1-U

   (a) spur gears   (b)helical gears   (c)spiral gears   (d) none of these

9. A differential gear in an automobile is a   CO1-U

   (a) simple gear train   (b) compound gear train

   (c) epicyclic gear train   (d) None of these

10. An automobile gearbox has   CO1-U

    (a) simple gear train   (b) compound gear train

    (c) epicyclic gear train   (d) None of these

PART – B (5 x 2= 10Marks)

11. Outline about degree of freedom   CO1-U

12. Explain velocity of the link.   CO1-U

13. Which type of cam follower motion is used in high speed engine   CO1-U

14. Explain the term 'arc of contact' in gear   CO1-U

15. Two parallel shafts, about 600 mm apart are to be connected by spur gears.One shaft is to run at 360 r.p.m. and the other at 120 r.p.m. calculate the speed ratio of the gear   CO3 - Ap

PART – C (5 x 16= 80Marks)

16. (a) Describe the three inversions of a Double slider with neat sketches   CO1-U   (16)

    Or

    (b) Explain the following mechanism with neat sketches: CO1-U   (16)
    - (i) Double Lever Mechanism   (6)
    - (ii) Double crank Mechanism   (6)
    - (iii) Watt indicators   (4)

17. (a) A four bar chain mechanism PQRS it is drive by the crank PQ which rotates at 600 rpm in clockwise direction. The link PS is fixed. Find the angular velocity of the links QR and RS. Link PQ = 62.5mm, QR =175mm, RS = 112.5mm, PS = 200mm, QPS = 50°.   CO2-App   (16)

    Or

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(b) The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine: 1. linear velocity and. angular velocity of the connecting rod, at a crank angle of 45° from inner dead centre position.   CO2-App   (16)

18. (a) A cam drives a flat reciprocating follower in the following manner   CO2 -App   (16)
Follower moves outwards through a distance of 20mm with SHM during first 120°of cam rotation.
Follower dwells during next 30° of cam rotation.
Follower moves inwards with SHM for next 120° of cam rotation.
The follower dwells for the remaining period.
Draw the profile of the cam, when minimum radius of cam is 50mm

<center>Or</center>

(b) Draw the cam profile for the following data   CO2-App   (16)
Basic circle radius of cam = 50mm, Lift = 40mm, Angle of ascent with Uniform velocity = 90°, Angle of Dwell = 90°, Angle of descent with uniform acceleration and deceleration = 90°, speed of cam = 300 rpm, Type of follower = Knife edge.

19. (a) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm, and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find (i) the angle turned through by pinion when one pair of teeth is in mesh; and (ii) the maximum velocity of sliding.   CO3-App   (16)

<center>Or</center>

(b) Two mating gears have 20 and 40 involute teeth of module 10mm and 20° pressure angle .The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half of the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio.   CO3-App   (16)

20. (a) In an epicyclic gear train, an arm carriestwo gears A and B having 36 and 45 teeth respectively. If the armrotates at 150 r.p.m. in the anticlockwise direction about the centreof the gear A which is fixed, determine the speed of gear B. If thegear A instead of being fixed, makes 300 r.p.m. in the clockwisedirection, what will be the speed of gear B ?   CO3-App   (16)

<center>Or</center>

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(b) In a reverted epicyclic geartrain, the arm A carries two gears B and C and aCompound gear D - E. The gear B meshes with gear Eand the gear C meshes with gear D. The number of teethon gears B, C and D are 75, 30 and 90 respectively.Find the speed and direction of gear C when gear B isfixed and the arm A makes 100 r.p.m. clockwise. CO3-App (16)

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