Reg. No. : | | | | | | | | | | | | |

Question Paper Code:U4701

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

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. A ball and a socket joint forms a CO1-U

   (a) turning pair (b) rolling pair (c) sliding pair (d) spherical pair

2. The mechanism forms a structure, when the number of degrees of freedom (n) is equal to CO1-U

   (a) 0 (b) 1 (c) 2 (d) – 1

3. The angular velocity (in rad/s) of a body rotating at N r.p.m. is CO1-U

   (a) π N/60 (b)2 π N/60 (c)π N/120 (d) π N/180

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

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

5. The cam follower generally used in aircraft engines is CO1-U

   (a) knife edge follower (b) flat faced follower

   (c) spherical faced follower (d) roller follower

6. The pressure angle of a cam depends upon CO1-U

   (a) offset between centre lines of cam and follower (b) lift of follower

   (c) angle of ascent (d) all of the mentioned

7. The size of a gear is usually specified by CO1-U

   (a) pressure angle (b)circular pitch (c) diametral pitch (d) pitch circle diameter

8. The product of the diametral pitch and circular pitch is equal to CO1-U

(a) 1 (b) $1/\pi$ (c) 2π (d) 3π

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. A gear train having the input and output gears mounted on the same axis is called CO1-U

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

(c) epicyclic gear train (d) reverted gear train

PART – B (5 x 2= 10Marks)

11. Outline about degree of freedom CO1-U

12. List out the conditions for rubbing velocity CO1-U

13. Why is roller follower preferred over knife edge follower? CO1-U

14. State the law of gearing CO1-U

15. Differentiate simple gear train and compound gear train CO1-U

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

(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) Draw the cam profile for the following data CO2 -App (16)
Basic circle radius of cam = 50mm, Lift = 40mm, Angle of ascent with SHM = 90°, Angle of Dwell = 90°, Angle of descent with uniform acceleration and deceleration = 90°, speed of cam = 300 rpm, Type of follower = Roller follower (With roller radius = 10mm).

Or

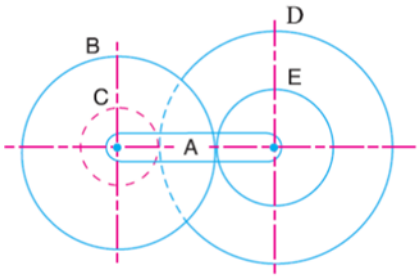
(b) A cam is designed for a knife edge follower with following data: Cam lift = 40mm during 90° of cam rotation with SHM, dwell for next 30°, during the next 60°of cam rotation, the follower returns to its original position with SHM, dwell during remaining 180°. Draw the profile of the cam. The radius of base circle of cam is 40mm. CO2-App (16)

19. (a) The number of teeth on each of the two equal spur gears in mesh are 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. CO3-App (16)

Or

(b) A pinion having 30 teeth drives agear 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. CO3-App (16)

20. (a) 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)



Or

(b) 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)