A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code:U4701

B.E./B.Tech. DEGREE EXAMINATION, APRIL 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. 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

2. A railway bridge is an example of a CO1-U

   (a)Machine (b) Structure (c) Kinematic chain (d) None of these

3. The magnitude of linear velocity of a point B on a link AB relative to point A is CO1-U

   (a) ω x AB (b) $\omega(AB)^2$ (c) $\omega^2 AB$ (d) $(\omega \times AB)^2$

4. 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

5. Cam size depends upon CO1-U

   (a) Base circle (b) Pitch circle (c) Prime circle (d) Outer circle

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

   (a) Minimise the side thrust (c) Avoid jerk

   (b) Accelerate (d) None of the mentioned

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

   (a) Pressure angle (c) Diametral pitch

   (b) Circular pitch (d) Pitch circle diameter

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

(a) 1 (b)1/ π (c)2 π (d) 3 π

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

(a) Simple gear train (c) Epicyclic gear train

(b) Compound gear train (d) None of these

10. When there is only one gear on each shaft is called as CO1-U

(a) Simple gear train (c) Epicyclic gear train

(b) Compound gear train (d) None of these

PART – B (5 x 2= 10 Marks)

11. Explain the kinematic pair. CO1-U

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

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

14. Define circular pitch. CO1-U

15. Define Compound gear Train. CO1-U

PART – C (5 x 16= 80 Marks)

16. (a) Describe the various inversions of four bar chain mechanism with sketches CO1-U (16)

Or

(b) Describe the various inversions of single slider crank mechanism with sketches CO1-U (16)

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 450r.p.m. The crank is 120 mm and the connecting rod is 450 mm long. Determine: angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position. CO2- App (16)

18. (a) A cam drives a Knife edge follower in the following manner During first 120° rotation of the cam, follower moves outwards through a distance of 40 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 40 mm. Draw the profile of the cam. CO2- App (16)

Or

(b) 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.

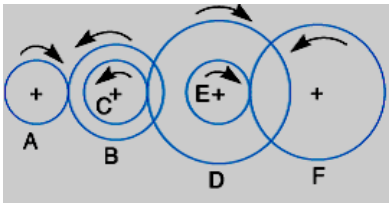
19. (a) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. CO3- App (16)

Or

(b) The pitch circle diameter of the smaller of the two spur wheels which mesh externally and haveinvolute teeth is 100 mm. The number of teeth are 16 and 32. The pressure angle is 20° and theaddendum is 0.32 of the circular pitch. Find the length of the path of contact of the pair of teeth. CO3- App (16)

20. (a) The gearing of a machine tool is shown in Fig. The motor shaft is connected to gear A and rotates at 975 r.p.m. The gear wheels B, C, D and E are fixed to parallel shafts rotating together. The final gear F is fixed on the output shaft. What is the speed of gear F? The number of teeth on each gear are as given below CO3- App (16)

Gear	A	B	C	D	E	F
No. of teeth	20	50	25	75	26	65



Or

(b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a Compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B i s fixed and the arm A makes 100 r.p.m. clockwise. CO3- App (16)