



**VIT**  
Vellore Institute of Technology  
(Established by an Act of Parliament under section 3 of IIT Act, 1958)

SLOT: B1+TB1

REG.NO.:

208ME02000

**SCHOOL OF MECHANICAL ENGINEERING**  
**CONTINUOUS ASSESSMENT TEST (CAT) -II**  
**WINTER SEMESTER 2025-2026**

Programme Name & Branch : B. TECH (Mechanical Engineering)  
Course Code : BMEE207L  
Course Name : Kinematics and Dynamics of Machines  
Faculty Name(s) : Dr. Narendiranath Babu T., Dr. J. Naveen, Dr. Benedict Thomas, Dr. Senthilnathan N, Dr. Edwin Sudhagar P, Dr. Sridharan K.  
Class Number(s) : VL2025260502908, 2911, 2907, 2909, 2906, 2912  
Date of Examination : 16/03/2026  
Exam Duration : 90 minutes

Maximum Marks: 50

**General instruction(s):**

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes Statements:  
CO. 3: Analyse kinematics of cam and gear-train mechanisms.  
CO. 4: Investigate the dynamic forces acting on planar mechanisms

| Q. No | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M  | CO  | BL |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 1.    | A cam with 30 mm as minimum diameter is rotating clockwise at a uniform speed of 1200 r.p.m. and has to give the following motion to a roller follower 10 mm in diameter:<br>a) Follower to complete outward stroke of 25 mm during 120° of cam rotation with equal uniform acceleration and retardation;<br>b) Follower to dwell for 60° of cam rotation;<br>c) Follower to return to its initial position during 90° of cam rotation with equal uniform acceleration and retardation;<br>d) Follower to dwell for the remaining 90° of cam rotation.<br>Draw the cam profile if the axis of the roller follower passes through the axis of the cam. | 10 | CO3 | 3  |
| 2.    | A pinion has 24 teeth and drives a gear with 64 teeth. The teeth are of involute type with 20° pressure angle. The addendum and the module are 8 mm and 10 mm respectively. Determine path of contact, arc of contact and the contact ratio.                                                                                                                                                                                                                                                                                                                                                                                                          | 10 | CO3 | 3  |



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3. A compound epicyclic gear is shown diagrammatically in Figure 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.

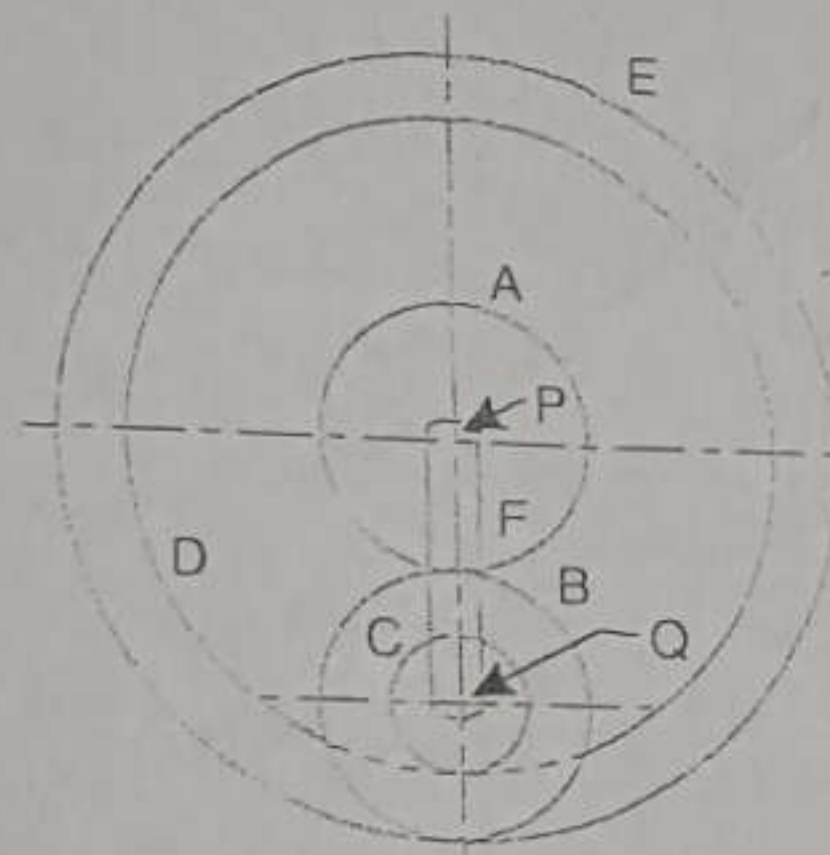


Figure 1

4. Design a four-link mechanism to coordinate three positions of the input and the output links given by
- $$\theta_1 = 25^\circ, \phi_1 = 30^\circ$$
- $$\theta_2 = 35^\circ, \phi_2 = 40^\circ$$
- $$\theta_3 = 50^\circ, \phi_3 = 60^\circ$$
- Use Freudenstein's equation method to solve the problem.

5. Design a four-link mechanism to coordinate three positions of the input and of the output links for the following angular displacements by inversion (graphical) method:
- $$\theta_{12} = 30^\circ, \phi_{12} = 75^\circ$$
- $$\theta_{13} = 40^\circ, \phi_{13} = 65^\circ$$

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