GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester Regular) Examinations, May – 2024

22BMEPC24003 - Kinematics of Machinery

(Mechanical)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the term kinematic link. Give the classification of kinematic link.	CO1	K2
b. Define degree of freedom of a mechanism? How to determine it.	CO1	K1
c. What do you understand by the instantaneous centre of rotation in kinematic of Machines? Answer briefly.	CO2	K2
d. What are the different types of motion with which a follower can move?	CO3	K1
e. What do you mean by Bevel gear? Explain the application of Bevel Gear.	CO4	K1

PART – B **(15 x 4=60 Marks)**

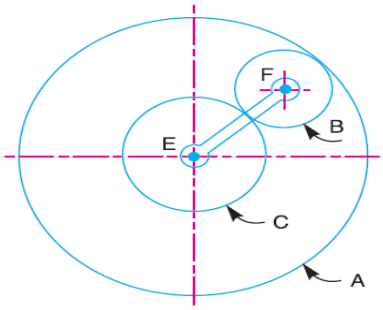
Answer **ALL** questions	Marks	CO #	Blooms Level
2. a. Sketch and explain the various inversions of a slider crank chain.	10	CO1	K2
b. Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain?	5	CO1	K2
(OR)			
c. Sketch and explain any two inversions of a double slider crank chain.	10	CO1	K2
d. Sketch and explain Beam engine.	5	CO1	K2
3.a. Locate all the instantaneous centers of the slider crank mechanism. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: **(i)** Velocity of the slider A, and **(ii)** Angular velocity of the connecting rod AB. The angle AOB = 45°.	10	CO2	K3
b. Define rubbing velocity at a pin joint. What will be the rubbing velocity at pin joint when the two links move in the same and opposite directions?	5	CO2	K2
(OR)			
c. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.Solve it by relative velocity method.	10	CO2	K3
d. Write down the Method of Locating Instantaneous Centers in a Four bar Chain Mechanism.	5	CO2	K2
4.a. A cam is to give the following motion to a knife-edged follower: **(i)** Outstroke during 90° of cam rotation **(ii)** Dwell for the next 60° of cam rotation **(iii)** Return stroke during next 90° of cam rotation, and	10	CO3	K3

(iv) Dwell for the remaining 120° of cam rotation.

The stroke of the follower is 50 mm and the minimum radius of the cam is 60 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower is offset by 20 mm from the axis of the cam shaft.

b.	Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uniform acceleration and retardation.	5	CO3	K2

(OR)

c.	A cam is to be designed for a knife edge follower with the following data: **1.** Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. **2.** Dwell for the next 30°. **3.** During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. **4.** Dwell during the remaining 180°. Draw the profile of the cam when **(i)** the line of stroke of the follower passes through the axis of the cam shaft, and **(ii)** the line of stroke is offset 20 mm from the axis of the cam shaft. The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.	15	CO3	K3
5.a.	An epicyclic gear consists of three gears A, B and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m.. If the gear A is fixed, determine the speed of gears B and C. 	10	CO4	K3
b.	With a neat sketch find the gear ratio of compound gear train.	5	CO4	K2

(OR)

c.	What do you understand by 'gear train'? Discuss the various types of gear trains.	8	CO4	K2
d.	Explain the advantages and disadvantages of Gear Drive. Sketch and explain Rack and pinion Mechanism.	7	CO4	K2

--- End of Paper ---