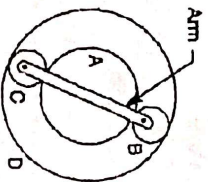


UNIT – III

6. An epicyclic train of gears is arranged as shown in figure. How many revolutions does the arm, to which the pinions B and C are attached, make :
- (i) When A makes one revolution clockwise and D makes half a revolution anticlockwise and stationary ?
- (ii) When A makes one revolution clockwise and D is stationary ?

The number of teeth on the gears A and D are 40 and 90 respectively.



7. Explain Freudenstein's method of three point synthesis of mechanisms. 15

UNIT – IV

8. Derive the equation for torque required to lift the load by a screw jack 15
9. Find the length of the cross belt and power transmitted by a belt. 15

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( 4 )

Roll No. ....

3210

B. Tech. 5th Semester (ME)  
Examination – December, 2022

KINEMATICS OF MACHINE

Paper : PCC-ME-307-G

Time : Three Hours ]

[ Maximum Marks : 75

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *free* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Explain the following : 2.5 × 6 = 15
- (a) Discuss the kinematic pair and kinematic link.
- (b) Difference between machine and mechanism.
- (c) Degree of freedom.

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- (d) Explain types of pulleys.
- (e) Define the creep of belt.
- (f) What are the advantages of epicyclic gearing?

**UNIT - 1**

- 2.** Sketch and explain the various inversions of a slider crank chain mechanism. 15
- 3.** The crank and connecting rod of a horizontal steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned  $45^\circ$  from the inner dead centre position, determine :
- (i) Velocity of piston.
  - (ii) Angular velocity of connecting rod,
  - (iii) Velocity of point E on connecting rod 1.5 m from the gudgeon pin.
  - (iv) Velocity of rubbing at the pins of the crank shaft, crank and cross-head when the diameters of their pins are 5 cm, 3 cm, 6 cm respectively.
  - (v) Position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank-shaft.

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**UNIT - II**

- 4.** A cam, with a minimum radius of 25mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : 15
- (i) To rise the valve through 50 mm during  $120^\circ$  rotation of the cam;
  - (ii) To keep the valve fully raised through next  $30^\circ$ ;
  - (iii) To lower the valve during next  $60^\circ$ ; and
  - (iv) To keep the valve closed during rest of the revolution i.e.  $150^\circ$ ;
- The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m. Draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam.

- 5.** Derive the expression for the length of arc of contact in a pair of meshed spur gears. 15

3210-1850-(P-4)(Q-9)(22) ( 3 ) P. T. O.