CBCS SCHEME

18AU43

Fourth Semester B.E. Degree Examination, June/July 2023
Kinematics of Machines

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define the following :
     i) Link   ii) Kinematic pair   iii) Kinematic chain   iv) Degree of freedom v) Structure.
     (05 Marks)
   b. Differentiate between machine and mechanism.   **(05 Marks)**
   c. With neat sketch, explain any two inversions of four bar chain.   **(10 Marks)**

OR

2 a. Explain Peauellier straight line motion mechanism with a neat sketch.   **(10 Marks)**
   b. With a neat sketch, explain the pantograph.   **(10 Marks)**

Module-2

3 a. Explain velocity and acceleration analysis of four bar mechanism.   **(10 Marks)**
   b. Explain velocity and acceleration analysis of slider crank mechanism.   **(10 Marks)**

OR

4 a. Explain and derive an expression for Coriolis components of acceleration. **(10 Marks)**
   b. A four bar chain ABCD has fixed link AD = 1m. The driving crank AB = 0.3. The follower
      link CD = 0.6m and the connecting link BC = 1.2m. The crank AB rotates at a speed of
      300rpm clock wise with an angular acceleration of 200 rad/sec^2 in anti-clock wise direction.
      When the angle made by the crank with the fixed link is 135° in anti clock wise direction.
      Determine :
      i) Angular velocity of link BC and CD
      ii) Acceleration of B and C
      (10 Marks)

Module-3

5 a. Sketch and explain Klein's construction for single slider – crank mechanism.   **(10 Marks)**
   b. In a pin jointed four bar mechanism as shown in Fig Q5(b), AB = 150mm, BC = CD =
      180mm and AD = 300mm. The angle of BAD = 60°. The crank AB rotates uniformly at
      100rpm. Locate all the instantaneous center and find the angular velocity of the link BC.

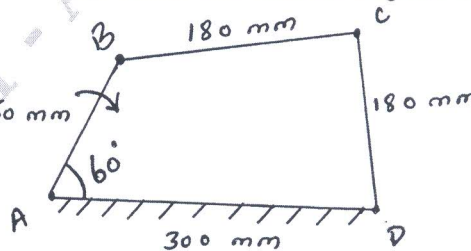Fig Q5(b)   **(10 Marks)**

OR

6 For an inclined slider crank mechanism of crank length of 5mm, crank angle of 30° and connecting rod length 150mm, determine the velocity and acceleration of the slider using complex algebra method. Take the constant speed of the crank as 2100 rpm in clockwise direction.   **(20 Marks)**

Module-4

7 a. Derive an expression for path of contact.   **(10 Marks)**
   b. A pair of spur gears has 16 teeth and 18 teeth, a module 12.5mm an addendum 12.5mm and a pressure angle 14.5°. Prove that the gears have interference. Determine the minimum number of teeth and the velocity to avoid interference.   **(10 Marks)**

OR

8 a. An epicyclic gear consists of three gears A, B and C as shown in Fig Q8(a). 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 rpm. If the gear A is fixed, determine the speed of gears B and C.
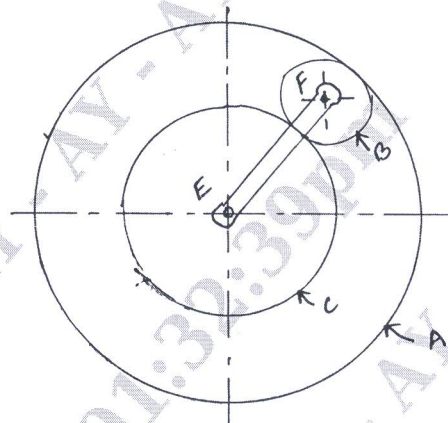

Fig Q8(a)   **(12 Marks)**
   b. Explain the types of gear train.   **(08 Marks)**

Module-5

9 a. With a neat sketch, explain the types of cams.   **(10 Marks)**
   b. Explain the types of followers with a neat sketch.   **(10 Marks)**

OR

10 Draw the profile of a cam operating a roller reciprocating follower and with the following data :
   Minimum radius of cam = 25mm
   Lift = 30mm
   Roller diameter = 15mm
   The cam lifts the follower for 120° with SHM, followed by a dwell period of 30°. Then the follower lowers down during 150° of cam rotation with uniform acceleration and retardation followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration of follower during the descent period.   **(20 Marks)**

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