CBCS SCHEME

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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.

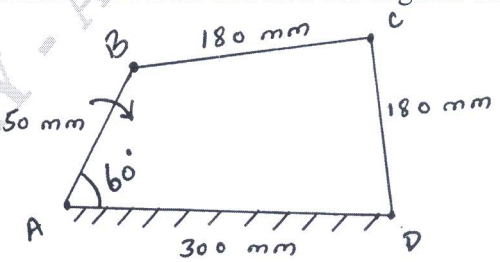

Fig Q5(b) **(10 Marks)**

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. **(12 Marks)**

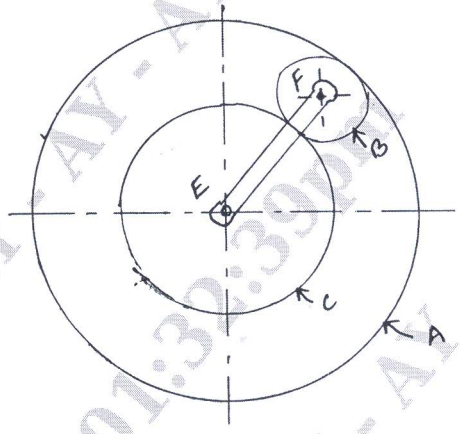

Fig Q8(a)

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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