CBCS SCHEME

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17AU43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Kinematics of Machines

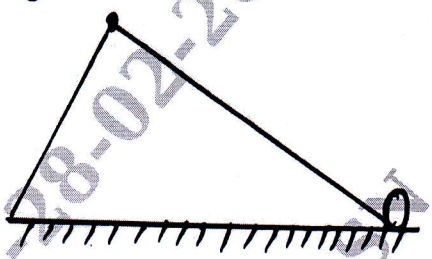
Time: 3 hrs. Max. Marks: 100

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

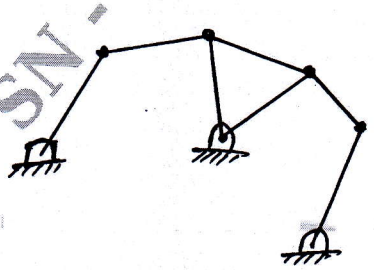
Module-1

1 a. Explain with neat sketch the working of
i) Geneva wheel mechanism ii) Ratcheted power mechanism **(12 Marks)**

b. Calculate the degree of freedom for the following :



i) Fig Q1(b) (i)



ii) Fig Q1(b) (ii)

(08 Marks)

OR

2 a. With a neat sketch explain i) Robert's mechanism ii) Peancellier's mechanism. **(10 Marks)**

b. Explain with neat sketch, the working of Whitworth Quick Return motion mechanism, **(10 Marks)**

Module-2

3 A four bar mechanism ABCD made up four links, pin joined at ends. AD is a fixed link which is 180 mm long. The links AB, BC and CD are 90mm, 120mm and 120mm long respectively. At certain instant, the link AB makes an angle of 60° with the link AD, if the link AB rotates at uniform speed of 100rpm clockwise. Determine: i) Angular velocity of the links BC and CD ii) Angular acceleration of the link CD and CB. **(20 Marks)**

OR

4 In a slider crank mechanism the crank OB = 30mm and the connecting rod BC = 120mm. The crank rotates at a uniform speed of 300rpm clockwise. For the crank position shown in Fig Q4, in which the crank is turned 60°. Find : i) Velocity of Piston C and angular velocity of connecting rod BC ii) Acceleration of piston C and angular acceleration of connecting rod BC.

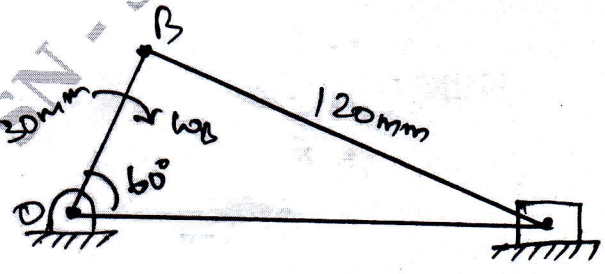


Fig Q4 **(20 Marks)**

Module-3

5 In a reciprocating engine the length of crank is 25cm and length of connecting rod is 100cm. The crank rotates at an uniform speed of 300rpm. By Klein's construction determine : i) Velocity and acceleration of piston ii) Angular velocity and angular acceleration of connecting rod iii) Velocity and acceleration of the point on the connecting rod is 40cm from crank end, when the crank is 30° from inner dead center. **(20 Marks)**

OR

6 a. Describe with a neat sketch Kennedy's theorem. **(10 Marks)**

b. Derive an expression for slider crank mechanism using Klein's construction. **(10 Marks)**

Module-4

7 In an epicyclic gear train the internal wheel A and F and the compound wheel C, D rotate about the axis 'O'. The wheels B and E rotate on a pin fixed to the arm L. The wheels have same pitch and number of teeth on B and E are 18, C = 28 and D = 26. If the arm L makes 150rpm clockwise. Find the speed of F when i) Wheel A is fixed ii) Wheel A makes 15rpm clockwise. **(20 Marks)**

OR

8 a. Two equal spur gears of 48 teeth mesh together with pitch radii of 100mm and the addendums are 4.25mm. If the pressure angle is 20°. Calculate the length of action and contact ratio. **(10 Marks)**

b. Derive an expression for length of path of contact, length of arc of contact and contact ration. **(10 Marks)**

Module-5

9 A cam with 3cm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to the knife edge follower as follows i) Follower to move outward through 3cm during 120° of cam rotation with SHM ii) Dwell for the next 60° iii) Follower to return to its starting position during the next 90° with UARM iv) Dwell for the remaining period. Draw the cam profile a) follower axis is offset to the right by 1cm b) Follower axis passes through cam axis. Also find the maximum velocity and acceleration during outward and inward or return stroke. **(20 Marks)**

OR

10 A cam rotating clockwise at uniform speed of 300rpm operates a reciprocating follower through a roller of 2.0cm in diameter. The follower motion is defined as follows :
i) outward during 150° with UARM ii) Dwell for next 30° iii) Return during next 120° with SHM iv) Dwell for the remaining period.
Stroke of the follower is 3cm. Minimum radius of the cam is 3cm. Draw the cam profile.

a) Follower axis passes through cam axis
b) Follower axis is offset to the left by 1cm **(20 Marks)**

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