CBCS SCHEME

USN | | | | | | | | | | |

15AU43

Fourth Semester B.E. Degree Examination, July/August 2022
Kinematics of Machines

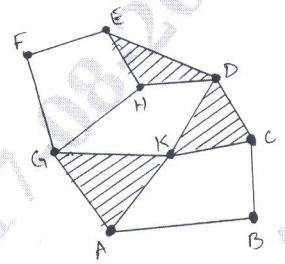
Time: 3 hrs. Max. Marks: 80

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

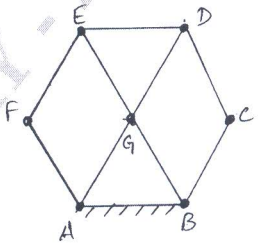
Module-1

1 a. Define the terms: i) Kinematic link ii) Kinematic pairs iii) Kinematic chain iv) Mechanism v) Structure. **(08 Marks)**

b. Calculate the degrees of freedom



(i)



(ii)

(08 Marks)

OR

2 a. Explain with neat sketch the working of crank and slotted lever mechanism. **(08 Marks)**

b. Derive the expression for pantograph with suitable figure. **(08 Marks)**

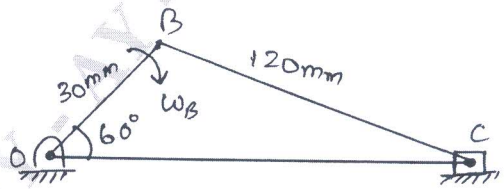
Module-2

3 A four bar mechanism ABCD is madeup of four links, pin jointed at ends. AD is a fixed link which is 180mm 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. **(16 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.Q.4, 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. **(16 Marks)**

Fig.Q.4



Module-3

5 a. Derive an expression for slider crank mechanism using Klein's construction. **(08 Marks)**

b. Determine the velocity and acceleration of the piston by Klein's construction to the following specifications:Stroke = 300mm; Ratio of length of connecting to crank length = 4; Speed of the engine = 300rpm; Position of crank = 45° with inner dead center. **(08 Marks)**

OR

6 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 300 rpm. 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 a point on the connecting rod 40cm from crank end, when the crank is 30° from inner dead centre. **(16 Marks)**

Module-4

7 a. Derive an expression for length of arc of contact, length of path of contact and contact ratio. **(08 Marks)**

b. 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. **(08 Marks)**

OR

8 In an epicyclic gear train, the internal wheels A, F and the compound wheel C, D rotate about the axis 'O'. This wheels B and E rotate on a pin fixed to the arm L. The wheels have same pitch and the number of teeth on B and E are 18, C = 28, 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. **(16 Marks)**

Module-5

9 A cam rotating clock wise at uniform speed of 300rpm operates a reciprocating follower through a roller 2.0cm. 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 right by 1cm. **(16 Marks)**

OR

10 A cam with 3cm as minimum radius is rotating clockwise at a uniform speed of 1200rpm 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 passes through cam axis
b. Follower axis is offset to the left by 1cm. Also find the maximum velocity and acceleration during outward and inward or return stroke. **(16 Marks)**

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