CBCS SCHEME

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17AU43

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) Kinematic link
ii) Kinematic chain
iii) Inversion
iv) Mechanism
v) Machine and structure. **(10 Marks)**

b. Explain with neat sketch construction and working of crank and slotted lever quack return mechanism. **(10 Marks)**

OR

2 a. Sketch and explain Ratchet and Pawl Mechanism. **(06 Marks)**

b. Sketch and explain Geneva Mechanism. **(06 Marks)**

c. Sketch and explain Ackermann Steering Gear Mechanism. **(08 Marks)**

Module-2

3 A four bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is a fixed link which is 180mm long. The link 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 a uniform speed of 100rpm clockwise.
Determine :
i) Angular velocity of the links BC and CD
ii) Angular acceleration of the links CD and CB. **(20 Marks)**

OR

4 a. State Kennedy's theorem and prove it. **(05 Marks)**

b. In a slider crank mechanism, the crank OA is 300mm and connecting rod AB = 1200mm. The crank OA is turned 30° from Inner dead centre. Locate all the instantaneous centers. If the crank rotates at 15rad/sec clockwise find :
i) Velocity of slider 'B'
ii) Angular velocity of connecting rod AB. **(15 Marks)**

Module-3

5 a. Using complex algebra derive expression for velocity and acceleration of the piston, angular acceleration of connecting rod of a reciprocating engine mechanism. **(10 Marks)**

b. If the crank and connecting rod are 150mm and 600mm long respectively and crank rotates of a uniform speed of 100rpm clockwise, determine :
i) Angular velocity and angular acceleration of connecting rod
ii) Velocity and acceleration of piston of using Ravenis approach. The angle which the crank makes with inner dead centre is 30°. **(10 Marks)**

OR

6 a. Illustrate use of Klein's construction for velocity diagram for slider crank mechanism. **(08 Marks)**

b. Determine the velocity and acceleration of the piston by Klein's construction to the following specification.
Stroke = 300mm ; Radio of length of connecting rod to crank, Length = 4;
Speed of Engine = 300rpm; Position of crank is 45° with Inner dead centre. **(12 Marks)**

Module-4

7 a. Sketch and explain the fundamental low of gearing. **(08 Marks)**

b. Compare Involute and cycloidal gear tooth profiles. **(06 Marks)**

c. What is interference in gears? Explain the method by which interference can be avoided. **(06 Marks)**

OR

8 Sketch and explain :

a. Simple gear train
b. Compound gear Train
c. Reverted Gear Train
d. Epicyclic gear train
e. Also give formula for Train value. **(20 Marks)**

Module-5

9 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 defined below :

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 when follower axis is offset to the right by 1cm. Also find the maximum velocity and acceleration during outward and inward stroke. **(20 Marks)**

OR

10 A cam rotating clockwise at uniform speed of 300rpm operates a reciprocating follower through a roller 1.5cm diameter. The following motion is defined below :

i) Outward during 150° with UARM
ii) Dwell for Next 30°
iii) Return during next 120° with SHM
iv) Dwell for Remaining period.

Stroke of the follower is 3cm. Minimum radius of cam is 3cm. Draw cam profile when follower axis passes through cam axis. **(20 Marks)**

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