CBCS SCHEME

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18AU43

Fourth Semester B.E. Degree Examination, June/July 2024
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. Derive the following terms :
i) Kinematic link ii) Kinematic chain iii) Mechanism iv) Inversions v) Machine **(10 Marks)**

b. Name the inversions of single slider rank chain and explain any one with neat sketch and give its applications. **(10 Marks)**

OR

2 With a neat sketch, explain : i) Quick return motion mechanism ii) Peaucelliers mechanism iii) Robert's mechanism. **(20 Marks)**

Module-2

3 A 4-bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is a fixed link which is 120mm long. The links AB, BC and CD are 60mm, 80mm and 80mm respectively. At certain instant, the link AB makes at an angle of 60° with the link AD. If the link AB rotates at a uniform speed of 10rpm clockwise direction determine,
i) Angular velocity of the links BC and CD
ii) Angular Acceleration of links BC and CD. **(20 Marks)**

OR

4 a. What is Coriolis component of acceleration? Derive the expression for the same. **(08 Marks)**

b. In the mechanism shown in Fig.Q4(b), the slider C is moving to the right with a velocity of 1 m/s and an acceleration of 2.5 m/s^2. The dimensions of various links are AB = 3m inclined at 45° with the vertical and BC = 1.5 m inclined at 45° with the horizontal. Determine:
(i) The magnitude of vertical and horizontal component of acceleration of the point B.
(ii) The angular acceleration of the links AB and BC.

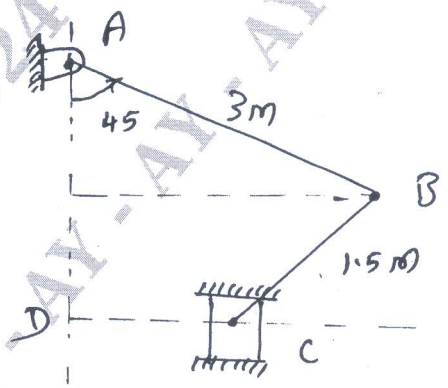

Fig.Q4(b) **(12 Marks)**

Module-3

5 a. State Kennedy's theorem and prove it. **(06 Marks)**

b. Locate all the instantaneous centers of the slider crank mechanism. The length of crank is 0.3 m and the length of connecting rod is 1.5 m. If the crank rotates at 450 rpm clockwise and the crank is inclined at 45° with IDC. Find:
(i) Velocity of connecting rod
(ii) Angle velocity of connecting rod **(14 Marks)**

OR

6 The crank radius of a reciprocating engine is 90mm. The connecting rod is 360mm long and the crank rotates at 150rpm clockwise. Determine the velocity and acceleration of piston and angular velocity and angular acceleration of connecting rod. When the angle made the crank with IDC is 30°. The Klein's construction for solution. **(20 Marks)**

Module-4

7 a. Derive following with a neat sketch.
   i) Pitch circle diameter
   ii) Modules
   iii) Addendum and dedendum
   iv) Path of contact and arc of contact
   v) Pressure angle **(10 Marks)**

b. Two four gear wheels have 24 and 30 teeth and the standard addendum of 1 module. The pressure angle is 20°. Calculate the path of contact and arc of contact. **(10 Marks)**

OR

8 a. Name different types of gear trains. Explain any one gear train with a neat sketch. **(08 Marks)**

b. The Fig Q8(b) shows an epicyclic gear train where the arm 'A' is the driver and the annular gear D. is the follower. The wheel D has ½ teeth and B has 48 teeth. B runs freely on P and D is separately driven. The arm 'A' runs at 100 rpm and wheel D at 50 rpm in same direction. Find the torque on B is A receives 7.5 kW.

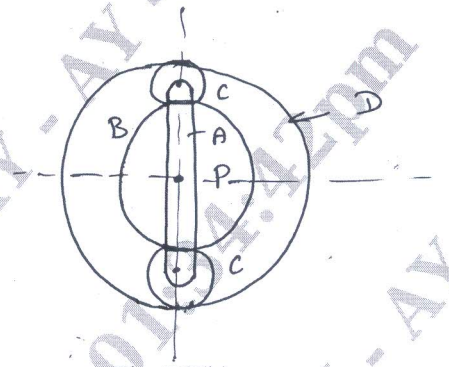

Fig Q8(b) **(12 Marks)**

Module-5

9 a. Define :
   i) Base circle and prime circle ii) Angle of ascent and decent **(04 Marks)**

b. A cam of base circle radius 50mm is to operate Q roller follower of 20mm diameter the follower is to have SHM. The speed of the cam is 360° clockwise. Draw the cam provide for the cam lift of 40mm. Angle of ascent = 60°, angle of dwell = 40 angle of descent = 90° followed by dwell again. Also calculate maximum velocity and acceleration during ascent and descent. **(16 Marks)**

OR

10 A cam rotating clockwise at uniform speed of 300rpm operates a reciprocating follower through a roller 1.5cm 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 permit

Stroke of the follower is 3cm, minimum radius of the cam is 3cm. Draw the cam proving. **(20 Marks)**

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