CBCS Scheme

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15AU43

Fourth Semester B.E. Degree Examination, June/July 2018
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 following terms with neat sketches:
i) Kinematic chain ii) Inversions
iii) Mechanism iv) Machine and structure **(08 Marks)**

b. Name the inversions of double slider crank chain and explain any one with neat sketch and give its applications. **(08 Marks)**

OR

2 a. With the aid of neat sketch, explain the working of slotted lever quick return mechanism. **(08 Marks)**

b. What are intermittent motion mechanisms? Where they are used? Explain any one intermittent motion mechanism with neat sketch. **(08 Marks)**

Module-2

3 A four bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is fixed link which is 120 mm long. The links AB, BC and CD are 60 mm, 80 mm and 80 mm 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 10 rpm clockwise direction, determine:
i) Angular velocity of the link BC and CD
ii) Angular acceleration of the link BC and CD. **(16 Marks)**

OR

4 a. State Kennedy's theorem and prove it. **(04 Marks)**

b. Locate all the instantaneous centres 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 slider
ii) Angle velocity of connecting rod. **(12 Marks)**

Module-3

5 In a four bar mechanism ABCD, link AB = 300 mm, BC = 360 mm, CD = 360 mm and fixed link AD = 600 mm. The angle made by the link AB with fixed link AD = 60°. The link AB has an angular velocity 10 r/s and angular acceleration of 30 r/s^2 both clockwise. Determine the angular velocity and angular acceleration of link BC and CD. **(16 Marks)**

OR

6 The crank radius of a reciprocating engine is 90 mm, the connecting rod is 360 mm long and the crank rotates at 150 rpm clockwise. Determine the velocity and acceleration of piston and angular velocity and angular acceleration of connecting rod, when the angle made by the crank with the IDC is 30°. Use Klein's construction for solution. **(16 Marks)**

Module-4

7 a. Define following with a neat sketch:
i) Pitch circle diameter
ii) Module
iii) Addendum and dedendum
iv) Path of contact and arc of contact. **(08 Marks)**

b. Two spur 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. **(08 Marks)**

OR

8 a. With neat sketch explain reverted gear train. State its applications. **(06 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 112 teeth and B has 48 teeth. B runs freely on P and D is separately driven. The arm A runs at 100 rpm and the wheel D at 50 rpm in same direction. Find the torque on B if A receives 7.5 KW.

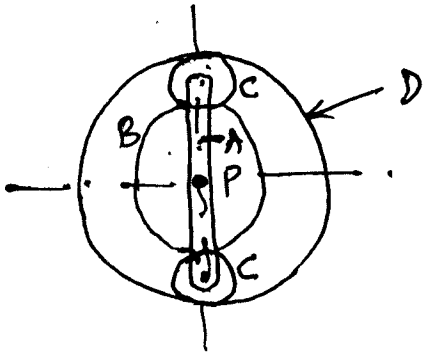

Fig.Q8(b) **(10 Marks)**

Module-5

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

b. A cam of base circle radius 50 mm is to operate a roller follower of 20 mm diameter the follower is to have SHM. The speed of the cam is 360° clockwise. Draw the cam profile for the cam lift of 40 mm. 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. **(12 Marks)**

OR

10 A cam with 25 mm as minimum radius is rotating clockwise at a uniform speed of 1000 rpm, and has to give the motion to the knife-edge follower as defined below:
i) Follower to move outwards through 25 mm during 120° cam rotation.
ii) Follower to dwell for the next 60° of cam rotation.
iii) Follower to return to its starting position during next 90° of cam rotation.
iv) Follower to dwell for the rest of the cam rotation.
The displacement of the follower takes place with uniform acceleration and retardation on both the outward and return strokes, draw the cam profile when follower axis is offset to right by 10 mm from the axis of cam. Determine the maximum velocity and acceleration during outstroke and return stroke. **(16 Marks)**

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