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10ME/AU/PM/TL44

Fourth Semester B.E. Degree Examination, December 2012
Kinematics of Machines

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO questions from each part.*
2. Graphical solution may be obtained either on graph sheet or on the answer book itself.

PART – A

1 a. Differentiate between:
i) Degree of freedom and mobility of mechanism.
ii) Kinematic chain and kinematic pair. **(08 Marks)**

b. Explain with a neat sketch, the single slider mechanism and its three inversions. **(12 Marks)**

2 a. Define 'Exact straight line motion'. Prove that a point on the Peaucellier's mechanism traces an exact straight line. **(10 Marks)**

b. Define 'Quick return motion' in a mechanism and using a neat sketch explain the drag link mechanism. **(10 Marks)**

3 In the mechanism shown in Fig.Q3, the slider 'C' is moving to the right with a velocity of 1 m/sec and an acceleration of 2.5 m/sec^2. The dimension of the various links are AB = 3 m, 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 the acceleration of the points 'B' and ii) The angular acceleration of links AB and BC. **(20 Marks)**

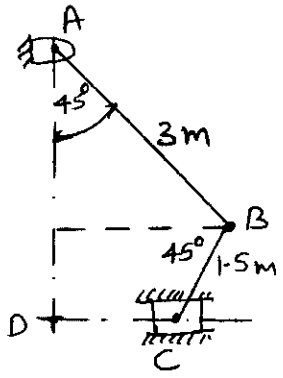

Fig.Q3

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

b. Explain the analysis of velocity and acceleration of a piston in a single slider mechanism using Klein's construction. **(06 Marks)**

c. For a pin jointed four bar mechanism having the following dimensions. Fixed link AD = 4m, Driving link AB = 1.5m, Driven link CD = 2.5m, connecting rod BC = 3m and angle BAD is 60°. Link AB rotates at 25 rpm. Determine using instantaneous centre method i) Angular velocity of link 'CD' and ii) Angular velocity of link BC. **(08 Marks)**

PART – B

5 The crank of an engine is 200 mm long and the ratio of connecting rod length to crank radius is 4. Determine the acceleration of the piston when the crank has turned through 45° from the inner dead centre position and moving at 240 rpm by complex algebra method. **(20 Marks)**

6 a. Derive an equation to determine the length of path of contact by a pair of mating spur gear. **(08 Marks)**

b. Two mating spur gears have 30 and 40 involute teeth of module 12 mm and 20° obliquity. The addendum on each wheel is to be made of such a length that the link of contact on each side of pitch point has half the maximum possible length. Determine the addendum height for each gear wheel and length of line of contact. **(12 Marks)**

7 In an epicyclic gear train, the internal gears A, B and the compound gears C - D rotates independently about a common axis O. The gears E and F rotates on pins fixed to the arm 'G' which turns independently about the axis 'O'. E gears with A and C, F gears with B and D. All gears have the same module. The number of teeth on gears C, D, E and F are 28, 26, 18 and 18 respectively.

i) Sketch the arrangement.
ii) If 'G' makes 100 rpm clockwise and gear 'A' is fixed, find speed of gear 'B'.
iii) If 'G' makes 100 rpm clockwise and gear 'A' makes 10 rpm C.C.W. find the speed of gear 'B'. **(20 Marks)**

8 A roller follower cam with a roller diameter of 10 mm is rotating clockwise. The lift of the cam is 30 mm and the axis of the follower is offset to the right by a distance of 5 mm. The follower completes the lift with SHM during 120° of cam rotation. The dwell at lift is 60° of cam rotation. First half of the fall takes place with constant velocity and second half with UARM during 120° of cam rotation. The rest is the dwell at fall. Draw the cam profile. **(20 Marks)**

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