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06ME44

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

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following :
i) Machine ii) Mechanism iii) Inversion iv) Mobility of mechanism. **(08 Marks)**

b. Describe with neat sketches of the following:
i) The crank slotted lever mechanism ii) Scotch yoke mechanism. **(12 Marks)**

2 a. Explain the Peaucellier's straight line mechanism with neat sketch. **(10 Marks)**

b. Sketch and explain:
i) Any one intermittent mechanism ii) Pantograph. **(10 Marks)**

3 A four bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is fixed link of 180 mm long, links AB, BC and CD are 90 mm, 120 mm and 120 mm long respectively. At certain instant, the AB rotates at an angle of 60° with link AD. If link AB rotates at a uniform speed of 100 rpm, clockwise, determine:
i) Angular velocity of links BC & CD ii) Angular acceleration of link BC & CD. **(20 Marks)**

4 a. In a four bar mechanism, the crank O_2A is 300 mm long, AB = O_4B = 360 mm and O_2O_4 the fixed link is 600 mm long. The crank makes an angle of 60° with the fixed link, and it rotates uniformly at 100 rpm. Locate all the instantaneous centers and find the angular velocity of links AB. **(10 Marks)**

b. A reciprocating engine mechanism has connecting rod 200 mm long and crank 50 mm long. By using KLEIN's construction, determine the velocity and acceleration of piston, and angular acceleration of connecting rod, when the crank has turned through 45° from IDC clockwise and is rotating at 240 rpm. **(10 Marks)**

PART – B

5 a. Explain the significance of loop closure equation with an example. **(05 Marks)**

b. The crank of an engine mechanism is 200 mm long and the ratio of connecting rod length to the crank radius is 4. Determine the acceleration of the piston when the crank has turned through an angle 45° from inner dead centre and rotating at a speed of 240 rpm ccw by complex algebra approach. **(15 Marks)**

6 a. State and prove law of gearing. **(06 Marks)**

b. A pinion having 20 teeth of involute form, 20° pressure angle and 6 mm module drives gear teeth having 40 teeth. If addendum is equal to module, find i) addendum and pitch circle radii of the two gears ii) length of path of approach iii) length of path of contact iv) length of arc of contact. **(14 Marks)**

7 a. Explain different types of gear trains with neat sketches. **(06 Marks)**

b. A fixed annular gear A and a smaller concentric rotating gear B are connected by a compound gear C & D. The gear C mesh with gear A and D with B. The compound gears revolved in a pin on the arm R, which revolves about the axis of A & B. The number of teeth on gears A, B & D are 150, 40 and 100 respectively. Determine the number of teeth on gear C, if the gears A & C have twice the module of gears B & D. How many revolutions will be make for one complete revolution of the arm R? **(14 Marks)**

8 Draw the profile of a cam operating a roller follower and with the following data: Minimum radius of cam = 25 mm. Lift = 30mm, roller diameter = 15mm. The cam lifts the follower for 120° with SHM followed by a dwell period of 30°, then the follower lowers down during 150° of the cam rotation with UARM followed by a dwell period. The cam rotates at a uniform speed of 150 rpm (cw direction). The axis of the follower passes through the axis of the cam shaft. Calculate the maximum velocity and acceleration of the follower during descent period. **(20 Marks)**

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