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15ME42

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Explain with neat sketch the mechanism required to convert rotary motion to reciprocating motion [which should have only one turning pair] (08 Marks)
- b. State and explain the suitable mechanism which can be used in Forming machines/sheet metal punching. (08 Marks)

OR

- 2 a. Some of the 4 bar linkages are shown in Fig Q2(a) where the number indicate the respective link in Lengths in 'cm'. Identify the nature of each mechanism whether
 - (i) double crank
 - (ii) crank rocker
 - (iii) Double Rocker. Give Reason in brief (12 Marks)

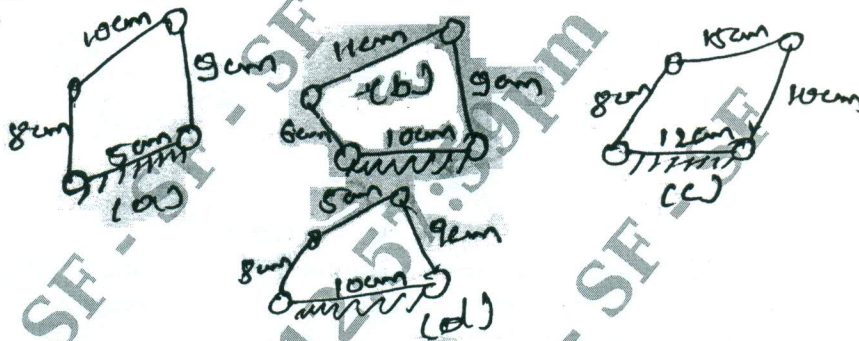


Fig Q2(a)

- b. Differentiate between
 - i) Machine and mechanism
 - ii) Binary joints and binary links (04 Marks)

Module-2

- 3 In the mechanism shown in Fig Q3 crank 2 rotates out 300 rpm. Find the acceleration of point C in magnitude, direction and sense. Find also the angular acceleration of link 3.

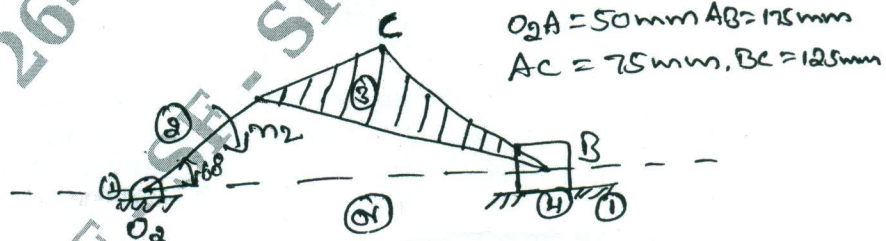


Fig Q3

(16 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 4 A pin jointed 4 bar mechanism ABCD show Fig Q4. Link AB = 150mm, BC = 180mm, CD = 180mm and fixed link AD = 300mm. Link AB makes 60° with link AD, and rotates uniformly at 100 rpm. Locate all the instantaneous centres and find the angular velocity of link BC and linear velocity of link CD.

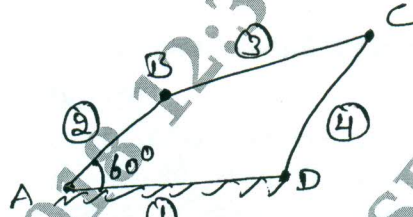


Fig Q4

(16 Marks)

Module-3

- 5 Develop an equation for the relationship between the Angular velocities of the input crank and output crank of 4 bar linkage shown in Fig Q5. Using loop closure equation.

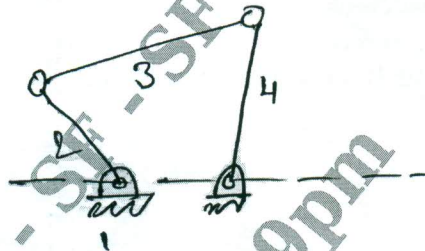


Fig Q5

(16 Marks)

OR

- 6 Design a four bar mechanism when the motions of the input and output links are governed by a function $y = -2x^2$ and x varies 2 to 4 with an interval of 1. Assume θ to vary from 40° to 120° and ϕ from 60° to 132° . (16 Marks)

Module-4

- 7 a. A pair of gears 40 and 30 teeth respectively are of 25° involute form. Addendum = 5mm, Module = 2.5mm. If the smaller wheel is the driver and rotate at 1500rpm, find the velocity of sliding at the point of engagement, out pitch point and the point of disengagement, length of path of contact and length of Arc of contact. (10 Marks)
- b. Explain minimum of teeth on a Gear to avoid interference and minimum number of teeth on a pinion to avoid interference. (06 Marks)

OR

- 8 In an epicyclic gear train, the internal wheels A, B and compound wheel C and D rotate independently about the axis 'O'. The wheels E and F rotate on a pin fixed to the Arm G. E gears with A and C, and F gears with B and D. All the wheels have same pitch and the number of teeth on E and F are 18, C = 28, D = 26
- Sketch the arrangement
 - Find the number of teeth on A and B
 - If the Arm G makes 15rpm CW and A is fixed, find speed of B
 - If the Arm G makes 150rpm CW and wheel A makes 15rpm CCW, find speed of B.

(16 Marks)

**Module-5**

- 9 A cam rotating clockwise at uniform, speed of 300 rpm operates a reciprocating follower through a roller 1.5cm diameter. The follower motion is defined as below
- Outward during 150° with U.A.R.M
 - Dwell for next 30°
 - Return during next 120° with SHM
 - Dwell for the remaining period
- Stroke of the follower is 3 cm. Minimum radius of the cam is 3 cm. Draw the cam profile, Follower axis passes through the cam axis. (16 Marks)

OR

- 10 A symmetrical tangent cam operating a roller follower has the following particulars Radius of base circle of cam = 40mm, Roller radius = 20mm, Angle of ascent = 75° , total lift = 20mm, $N = 300$ rpm. Determine :
- Principle Dimensions of the cam
 - The equation of the displacement curve when follower is in contact with straight flank.
 - Acceleration of the follower, when it is in contact with the straight flank where it merges into circular nose. (16 Marks)

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