CBCS SCHEME

USN | | | | | | | | | | |

16/17MDE23

Second Semester M.Tech. Degree Examination, June/July 2019
Dynamics and Mechanism Design

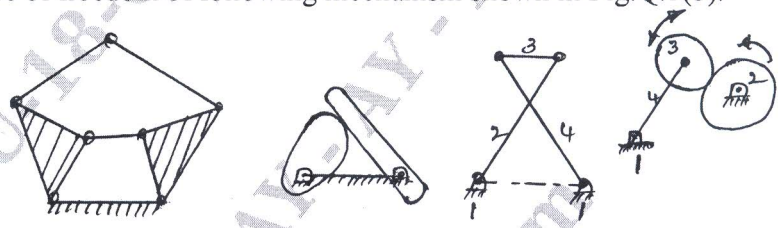
Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write down the differences between:
i) Analysis and synthesis
ii) Plane, spherical and spatial mechanism. **(08 Marks)**

b. Find the degree of freedom of following mechanism shown in Fig.Q.1(b). **(08 Marks)**



(i) (ii) (iii) (iv)

Fig.Q.1(b)

OR

2 a. State and explain Grashoff's law and equivalent mechanisms. **(06 Marks)**

b. Write short note on the following:
i) Auxiliary point method using rotated velocity vector.
ii) Goodman's indirect method. **(10 Marks)**

Module-2

3 a. What is a constraint? State the difference between Holonomic and non-holonomic constraints. **(06 Marks)**

b. State and explain the following:
i) Principle of virtual work
ii) D'Alembert's principle. **(10 Marks)**

OR

4 a. Derive the Lagrange's equations of motion from D'Alembert's principles. **(08 Marks)**

b. Using the Hamilton principle find the equation of motion for the system shown in Fig.Q.4(b). **(08 Marks)**

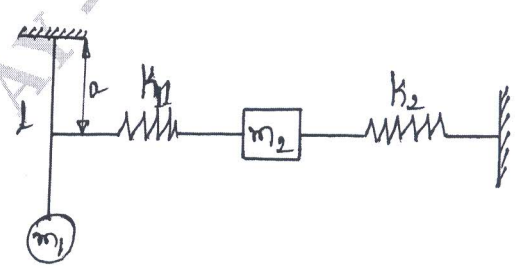


Fig.Q.4(b)

Module-3

5 a. Explain any four of the following:
   i) Type synthesis
   ii) Function generation
   iii) Path generation
   iv) Location of pole
   v) Relative pole. **(08 Marks)**

b. Write the equations to obtain optimum transmission angle with Crank-rocker mechanisms. **(08 Marks)**

OR

6 a. Explain with a neat sketch of two position synthesis of Slider-Crank mechanism. **(08 Marks)**

b. The rocker of Crank-Rocker mechanism is to have length of 55mm and Swing's through a total angle of 50° with a time ratio of 1.3. Determine the suitable set of dimensions. **(08 Marks)**

Module-4

7 Synthesize a function generator to generate a function $y = \log_{10}(x)$ in the interval $1 \le x \le 10$. The input crank is to rotate from 30° to 120° while the output lever moves from 240° to 330°. Use three accuracy points with Chebychev spacing and Freudenstein's equation. Plot the mechanism for frame length of 50mm. **(16 Marks)**

OR

8 Synthesize a four-bar mechanism to give the following values for the angular velocities and accelerations:

$W_2 = 200$ rad/sec, $\alpha_2 = 0$ rad/sec^2

$W_3 = 85$ rad/sec, $\alpha_3 = -1000$ rad/sec^2

$W_4 = 130$ rad/sec, $\alpha_4 = -16{,}000$ rad/sec^2.

Draw the mechanism. **(16 Marks)**

Module-5

9 The angular velocity of link-2 of the four-link RGGR mechanism is shown in Fig.Q.9. The length of crank = 100mm, connecting rod length = 375mm and the follower link = 250mm. If the angular velocity of the crank is 40k rad/sec and is constant, find the angular velocities and accelerations of link 3 and 4 respectively. **(16 Marks)**

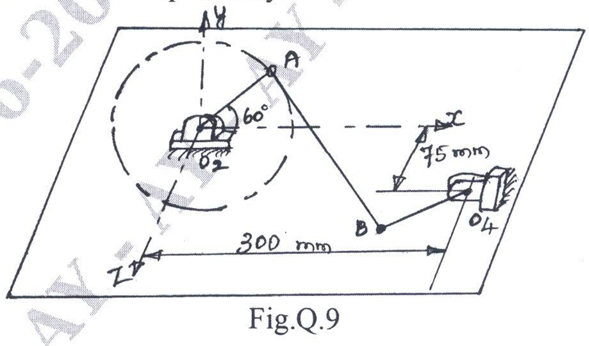


Fig.Q.9

OR

10 Write short notes on the following:
   a. Phase-plane representation
   b. Gyroscopic effect
   c. Eulerian angles. **(16 Marks)**

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