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M.Tech. EXAMINATION, May 2019

(Third Semester)

(B. Scheme) (Re-appear)

(ME)

MED601B

MECHANISM AND MANIPULATOR DESIGN

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

8. Explain any *three* of the following :

(a) Mobility and range of a mechanism

(b) Three position dimensional synthesis

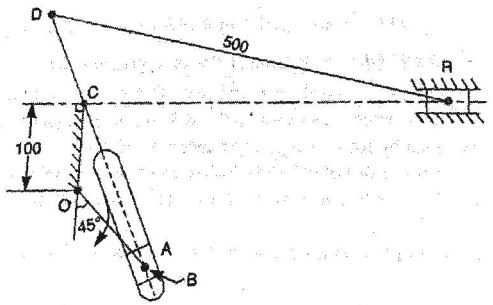
(c) Inverse and forward kinematics

(d) Instantaneous centre of velocity. **15**

Section I

1. Sketch and describe various inversions of 3R-1P mechanism. **15**

2. In a whitworth quick return motion, as shown in Fig. OA is crank rotating at 30 rpm in a clockwise direction. The dimensions of various links are : OA = 150 mm; OC = 100 mm; CD = 125 mm; and DR = 500 mm. Determine the acceleration of the sliding block R and angular acceleration of slotted lever CA. **15**



All dimensions in mm.

Section II

3. Explain the graphical synthesis of four bar mechanism. **15**

4. Design a four bar mechanism to coordinate input and outut angles as follows :
Input angles = 15º, 30º and 45º; Output angles = 30º, 40º and 55º. **15**

Section III

5. State different types of pneumatic actuators. What are the risks using pneumatic actuators ? **15**

6. Define forward and inverse kinematics. Calculate the Jacobian of two links planar arm when θ_1 = 45º and θ_2 = 30º. **15**

Section IV

7. Explain homogeneous transformation matrix and also prove rotational matrix is orthonormal matrix. **15**