I M.Tech - II Semester - Regular Examinations – AUGUST 2018

MECHANISM DESIGN AND SYNTHESIS
(MACHINE DESIGN)

Duration: 3 hours   Max Marks: 60

Answer the following questions.

1. a) How many DOF do the following have in their normal environment?   6 M
   i) A submerged submarine   ii) An earth-orbiting satellite
   iii) A surface ship   iv) A motorcycle
   v) The print head in a 9-pin dot matrix computer printer
   vi) The pen in an XY plotter

   b) Sketch the kinematic diagrams and find their total degrees of freedom.   9 M
   i) An automobile hood hinge mechanism
   ii) An automobile hatchback lift mechanism
   iii) An electric can opener

(OR)

2. a) Find the mobility of the mechanism shown in figure.   8 M
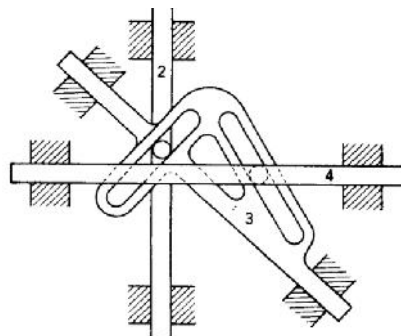
b) The link lengths of a planar four-bar linkage are 1,3,5 and 5 cm. Assemble them in all possible combinations and sketch the four inversions of each. Does these linkages satisfy Grashof's law? Describe each inversion by name. Also find the time ratio of the linkages. 7 M

3. Design a four bar mechanism for the following prescribed instantaneous values of angular velocity and angular acceleration of the three moving links. Driving Link: $\omega_1 = 10$ rad/sec and $\alpha_1 = 0$ rad/sec^2 , Coupling Rod: $\omega_1 = 2$ rad/sec and $\alpha_1 = 15$ rad/sec^2, Driven Link: $\omega_1 = 5$ rad/sec and $\alpha_1 = 10$ rad/sec^2 15 M

(OR)

4. Design a slider crank mechanism, the rotation of the crank from 45^0 to 120^0 (CCW) has to be converted into a 20 cm. translation of the slider (from left to right) so that the translation is proportional to the rotation of the crank. Design the mechanism using four Chebyshev's accuracy points.

15 M

5. Design a four bar mechanism for the function $Y = \log X$ in the interval of X as $1 \le X \le 10$ using three precision points. The range for ϕ is 30^0 to 60^0 and the range for ψ is 45^0 to 75^0.
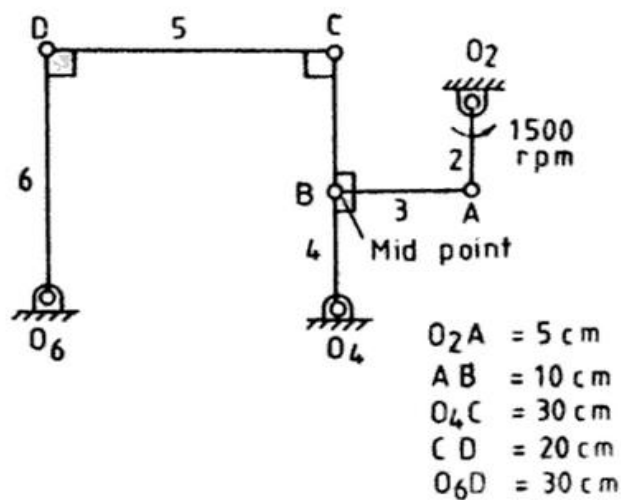
15 M

(OR)

6. Derive Freudenstein equation used for the synthesis of four bar mechanism. Explain about Chebyshev points of spacing.

15 M

7. Determine angular acceleration of link 6 in the mechanism as shown.

15 M

$O_2A = 5\ cm$
$AB = 10\ cm$
$O_4C = 30\ cm$
$CD = 20\ cm$
$O_6D = 30\ cm$

(OR)

8. In the mechanism as shown, the velocity and acceleration of slider D is 40 cm/sec and 450 cm/sec^2. Determine angular acceleration of link 3. Given O_2A=4.5 cm, AB=12cm, O_4B=6 cm, BC=2cm, AC=13 cm, and CD= 14 cm.

15 M