Seat No. | | | | | | |

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माला - 014

Design & Synthesis of Mechanism
(1080)

P. Pages : 2

Time : Three Hours **Max. Marks : 100**

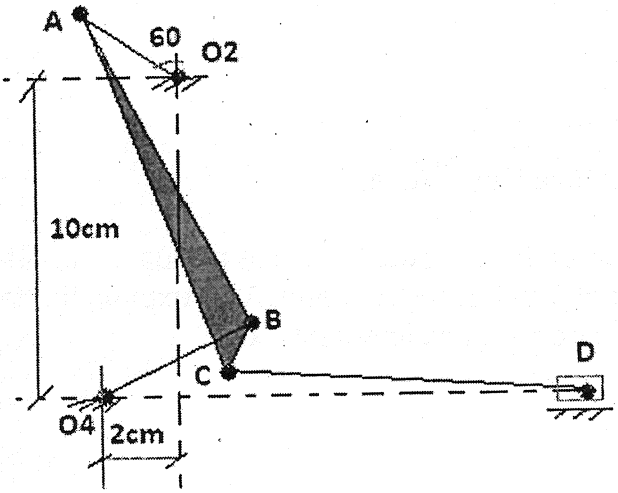
Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions.
5. Neat diagrams must be drawn wherever necessary.
6. Figures to the right indicate full marks.
7. Use of non programmable electronic pocket calculator is allowed.
8. Assume suitable data wherever necessary.

1. a) Define the different tasks of dimensional synthesis with suitable sketches. **6**

b) Discuss the concept of transmission angle of a four bar linkage as a measure of its performance. **6**

c) Explain DH parameters for spatial mechanism. **8**

2.



In the Atkinson engine mechanism shown in fig the velocity and acceleration of slider D are given as 40cm/s and 450cm/s^2 (towards right). Determine angular velocity and acceleration of link AO_2 and link ABC.
Dimensions :-O_2A = 4.5cm, AB = 12cm, O_4B = 6cm, BC = 2cm, AC = 13cm, CD = 14cm. **20**

3. a) Explain the following terms. **5**
i) Function generation. ii) Structural errors.

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b) Design and draw a four bar mechanism for the function $y = \log x$ is to be generated in the interval $1 \leq x \leq 2$, Assume $\Delta\theta = \Delta\varphi = 60°, \theta_o = 0°, \varphi_o = 0°$, fix link length = 5cm (use three accuracy points). **15**

4. a) For a floating link (AB) consecutive positions are known, synthesize a required four bar mechanism and calculate the transmission angles. Comment on resulting mechanism.
A1 (2.9, 9.5), A2 (5.8, 10.4), A3 (8.7, 11.25), B1 (13.5, 5.8), B2 (14.2, 2.9), B3(8.7, 0). **10**

b) Design a slider crank mechanism to co - ordinate three positions of input and output links as follows
$\theta_1 = 20°, \theta_2 = 35°, \theta_3 = 50°$, $S_1 = 80mm$, $S_2 = 60mm$, $S_3 = 30mm$. **10**

5. Explain Robert Chebychev's theorem for four bar and slider crank mechanisms. For linkage specified below obtain alternative linkages so that the coupler point "C" traces the same coupler curve as it traces as coupler point of the given four bar linkage.
$A_0A = 25$, $AB = 50$ $B_0B = 35$, $A_0B_0 = 60$, $AC = 24$, $BC = 40$ units.
In the given configuration the input angle $AA_0B_0 = 75°$ CCW. **20**

6. a) A-4 bar Linkage is to be designed for the following instantaneous values of angular velocities & accelerations. **10**

$\omega_2 = 6 rad/sec$ $\alpha_2 = 0 (input link)$
$\omega_3 = 1 rad/sec$ $\alpha_3 = 10 rad/sec^2 (coupler)$
$\omega_4 = 3 rad/sec$ $\alpha_3 = 10 rad/sec^2 (Output link)$

b) Explain the Bobilliar construction for determine the radius of curvature of a point on coupler link of four bar mechanism. Also explain the terms inflection pole, inflection circle and co lineation axis. **10**

7. Attempt the following **any four.** **20**

i) Cognate linkages.

ii) Inflection circle and pole.

iii) Cubic stationary curves.

iv) Four - accuracy point synthesis.

v) DH parameters for spatial mechanism.

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