



Instructions:

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks.

Q.1 Attempt the Following

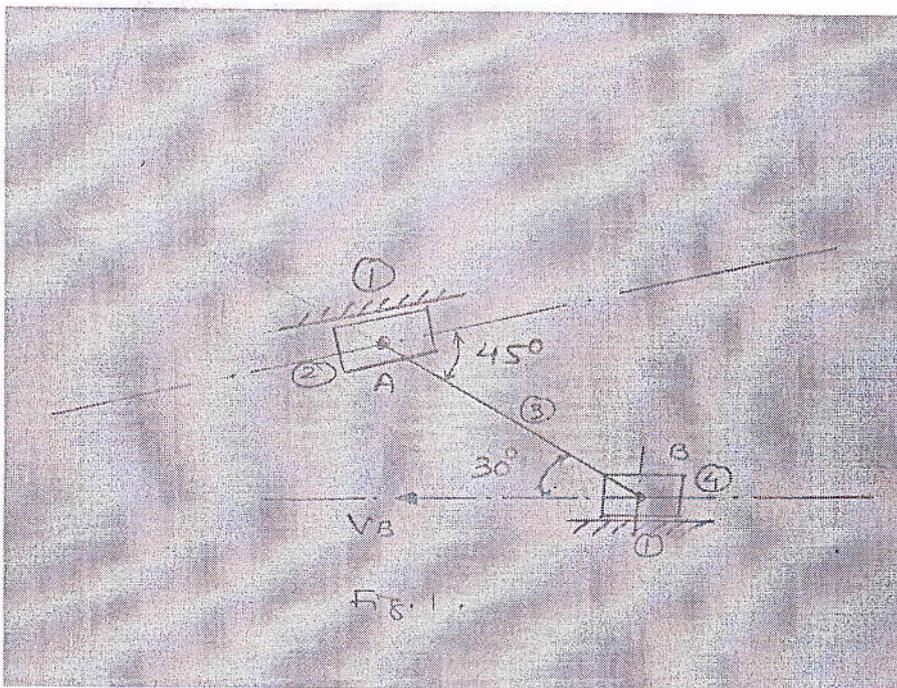
| Marks | Bloom's Level | CO |
|-------|----------------|-----|
| 04 | L ₃ | CO1 |
| 04 | L ₃ | CO1 |
| 06 | L ₄ | CO1 |

a) Explain the Grashof's Law with example.

OR

a) Explain the Kutzbach criterion with example.

b) The velocity of point B on the linkage is 40 m/sec. Find the velocity of point A and the angular velocity of link 3. AB= 100 mm. Ref. Fig.1



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Q.2 Attempt the Following

- a) Explain the fixed and moving centrodes with sketch. 04 L₃ CO2

OR

- a) Explain the applications of dwell mechanisms with example. 04 L₃ CO2

- b) Determine the velocity of points E and F by using I center method. 06 L₄ CO2

Given angular velocity of link OB is 22 rad/sec CCW. Ref Fig. 2

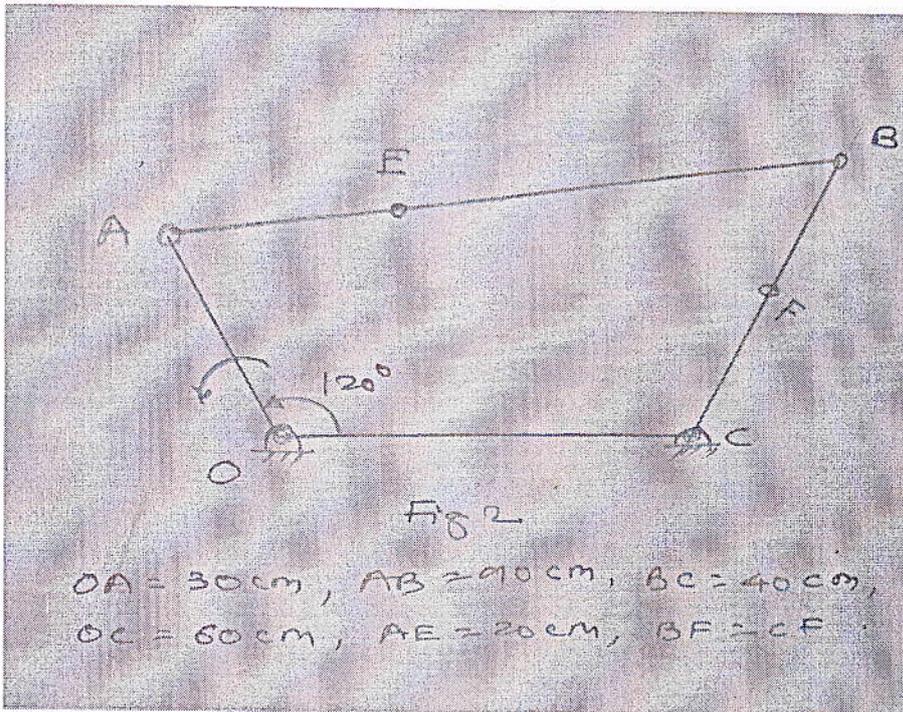


Fig.2

Q.3 Attempt the Following

- a) Design four bar chain to move link AB from given position A_1B_1 to A_2B_2 and then to A_3B_3 . Find the fixed pivot locations. $A_1(10,70)$, $B_1(40,85)$ $A_2(45,75)$ $B_2(75,65)$ $A_3(70,50)$ $B_3(105,70)$ 06 L₅ CO3

- b) Explain the error in synthesis of mechanisms with example 04 L₃ CO3

OR

- b) Explain type, number and dimension synthesis 04 L₃ CO3

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Q.4 Attempt the Following

- a) A four bar linkage is required to generate the function $y = x^{1.6}$ for $1 \leq x \leq 4$. The crank rotates from an angle of 30° to 120° whereas the follower rotates from an angle of 60° to 150° . Given that the length of the largest crank is 30 cm, determine the lengths of all the links. Use three point Chebeshev spacing.

OR

- a) Synthesize a four bar linkage to give following values for the angular velocities and accelerations,
- $\omega_2 = 200 \text{ rad/sec}$ $\omega_3 = 85 \text{ rad/sec}$ $\omega_4 = 130 \text{ rad/sec}$
 $\alpha_2 = 0 \text{ rad/sec}^2$ $\alpha_3 = -1000 \text{ rad/sec}^2$ $\alpha_4 = -1600 \text{ rad/sec}^2$

Q.5 Attempt the Following

- a) Design cognates of the coupler curve obtained by point P for the given mechanism. Ref Fig.3

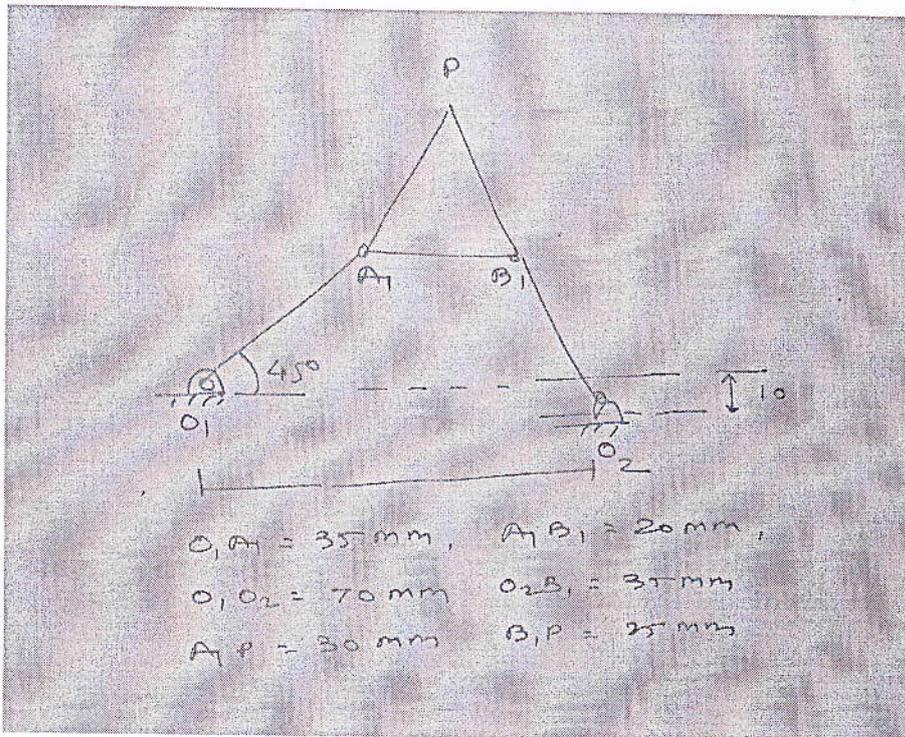


Fig. 3

- b) Explain the procedure application of coupler curves for designing dwell mechanism with suitable example.

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OR

- b) Explain the terms with sketch related to coupler curves, cusp, crunodes, single straight, double straight, triple loop 10 L₃ CO5

Q.6 Attempt the Following

- a) Explain the significance of Denavit-Hatenberg parameters used in the analysis of spatial mechanisms. 10 L₃ CO6

OR

- a) Explain the homogeneous transformation matrix used in matrix method for analysis of spatial mechanisms. 10 L₃ CO6

- c) The angular velocity of link 2 of the four bar chain O_2ABO_4 is 20 rad/sec cw uniform. Find the angular velocities and angular accelerations of link 3 and link 4 and the velocity of point B for the positions shown in fig.4. $O_2A = 100$ mm, $AB = 380$ mm, $BO_4 = 250$ mm. 20 L₄ CO6

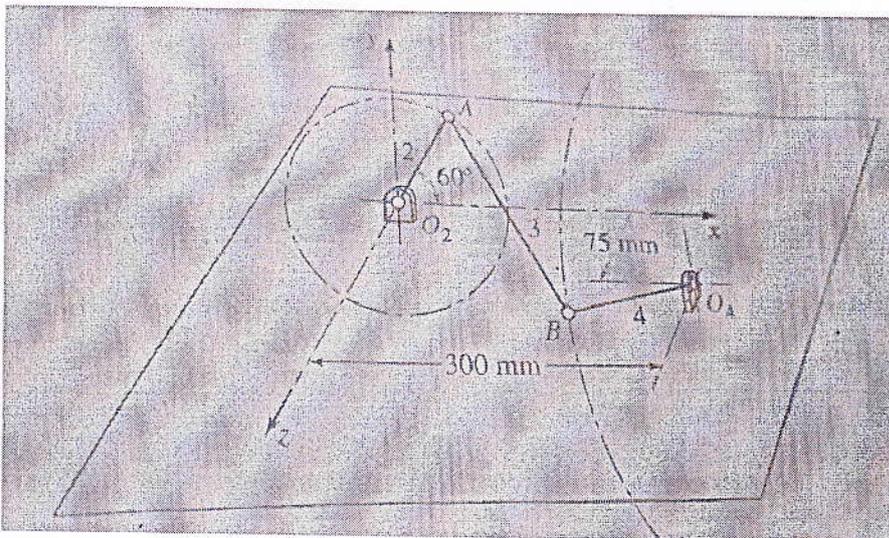


Fig. 4



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