



Sanjay Ghodawat University, Kolhapur

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2018-19

EXM/P/09/01

Year and Program: 2018-19

School of Technology

Department of FYM.Tech

Course Code: MMD502

Course Title: Analysis & Synthesis of Mechanisms

Semester – II

Day and Date Monday
20th May, 2019

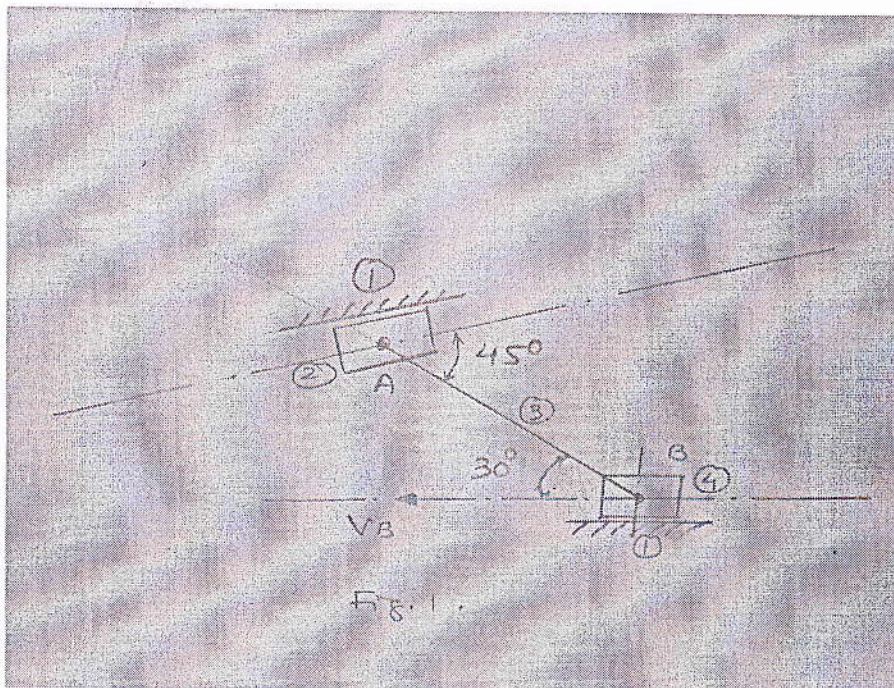
End Semester Examination
(ESE)

Time: Max Marks: 100
(2.30 to 5.30 pm)

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	CO
			Level	
a)	Explain the Grashof's Law with example.	04	L ₃	CO1
OR				
a)	Explain the Kutzbach criterion with example.	04	L ₃	CO1
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	06	L ₄	CO1



ESE

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Q.2 Attempt the Following

- | | | | | |
|----|--|----|----------------|-----|
| a) | Explain the fixed and moving centrodes with sketch. | 04 | L ₃ | CO2 |
| OR | | | | |
| a) | Explain the applications of dwell mechanisms with example. | 04 | L ₃ | CO2 |
| b) | Determine the velocity of points E and F by using I center method. | 06 | L ₄ | CO2 |
- Given angular velocity of link OB is 22 rad/sec CCW. Ref Fig. 2

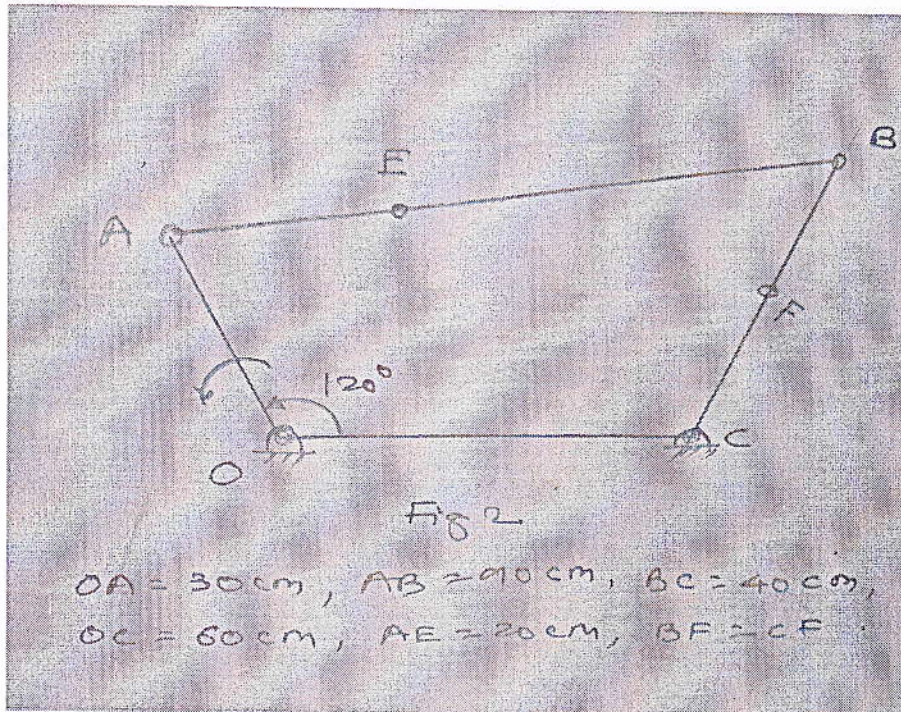


Fig.2

Q.3 Attempt the Following

- | | | | | |
|----|---|----|----------------|-----|
| a) | Design four bar chain to move link AB from given position A ₁ B ₁ to A ₂ B ₂ and then to A ₃ B 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 | L ₅ | CO3 |
| b) | Explain the error in synthesis of mechanisms with example | 04 | L ₃ | CO3 |
| OR | | | | |
| b) | Explain type, number and dimension synthesis | 04 | L ₃ | CO3 |

ESE

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 Chebyshev spacing. 10 L₅ CO4

OR

- a) Synthesize a four bar linkage to give following values for the angular velocities and accelerations, 10 L₅ CO5
- $\omega_2 = 200 \text{ rad/sec}$ $\omega_3 = 85 \text{ rad/sec}$ $\omega_4 = 130 \text{ rad/sec}$
 $\alpha_2 = 0 \text{ rad/sec}^2$ $\alpha_3 = -1000 \text{ rad/sec}^2$ $\alpha_4 = -1600 \text{ rad/sec}^2$

Q.5 Attempt the Following

- a) Design cognates of the coupler curve obtained by point P for the given mechanism. Ref Fig.3 20 L₅ CO5

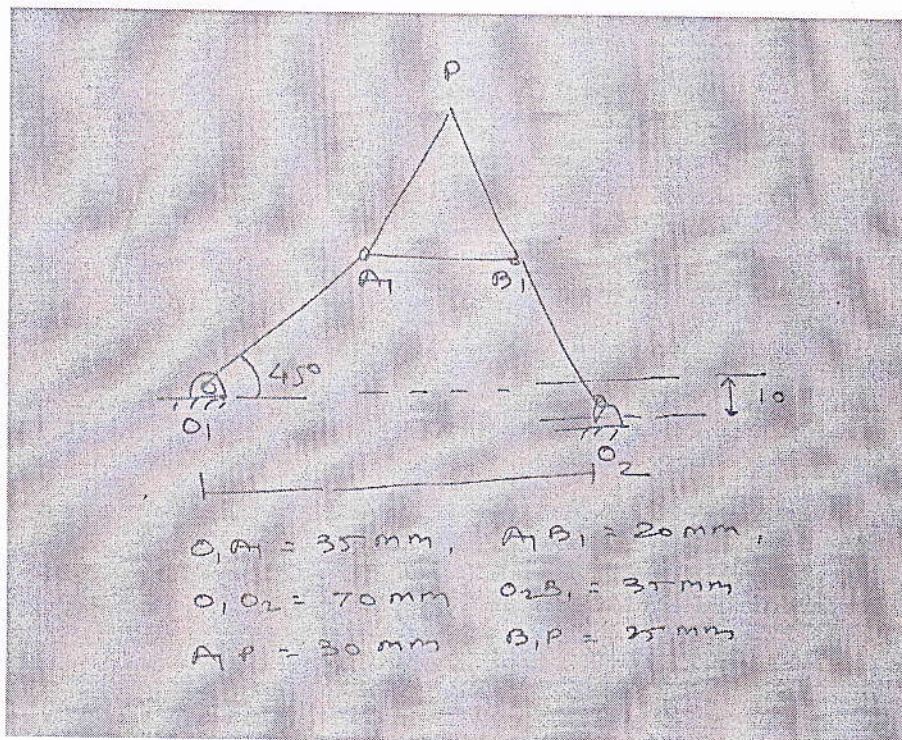


Fig. 3

- b) Explain the procedure application of coupler curves for designing dwell mechanism with suitable example. 10 L₃ CO5

ESE

OR

- | | | | | |
|----|--|----|----------------|-----|
| b) | Explain the terms with sketch related to coupler curves, cusp, crunodes, single straight, double straight, triple loop | 10 | L ₃ | CO5 |
|----|--|----|----------------|-----|

Q.6 **Attempt the Following**

- | | | | | |
|----|--|----|----------------|-----|
| a) | Explain the significance of Denavit-Hatenberg parameters used in the analysis of spatial mechanisms. | 10 | L ₃ | CO6 |
|----|--|----|----------------|-----|

OR

- | | | | | |
|----|---|----|----------------|-----|
| a) | Explain the homogeneous transformation matrix used in matrix method for analysis of spatial mechanisms. | 10 | L ₃ | 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 | L ₄ | CO6 |
|----|---|----|----------------|-----|

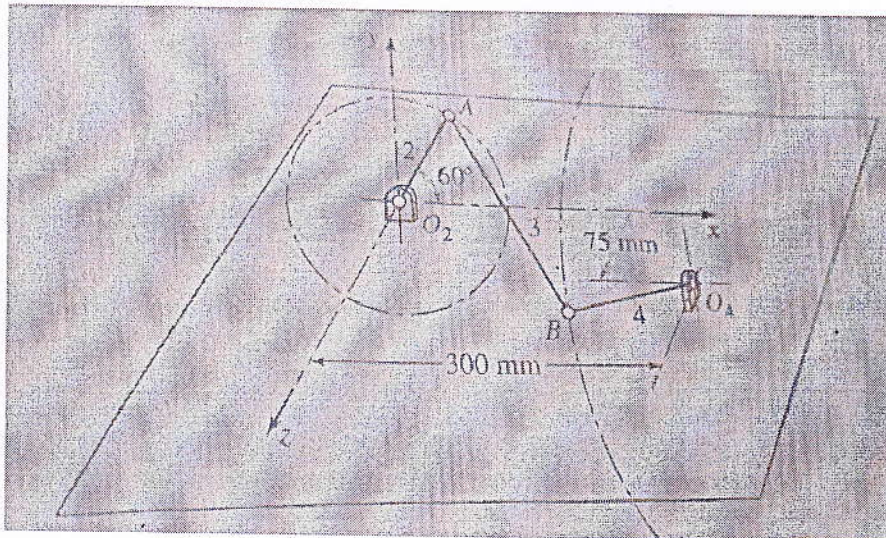


Fig. 4

