B.E. (Mechanical Engineering) Semester Seventh (C.B.S.)

Elective - I : Synthesis of Mechanisms

P. Pages : 2 **KNT/KW/16/7472**

Time : Three Hours * 0 8 7 6 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) State, explain and prove Robert – Chebyshev theorem of Cognate linkages. **7**

b) What are the different types of synthesis? Explain in detail. **6**

OR

2. a) State Grashof's law. How it is useful in linkage design? Also differentiate between class I and class II four bar chain. **7**

b) Define : **6**

a) Inversion of Mechanism.

b) Significance of toggle positions in linkages.

c) Grubler's Criterion.

3. a) State and prove the Eular -Savary equation. Also explain Bobillier construction. **7**

b) What is meant by transmission angle? Explain its importance. **6**

OR

4. a) Name the different types of methods available for synthesis of mechanism by using graphical method using one example. **5**

b) Synthesize a mechanism by relative pole technique for following data : **8**

$\theta_{12} = 20^o, \quad \phi_{12} = 40^o$

$\theta_{13} = 45^o, \quad \phi_{13} = 80^o$

length of fixed link $A_0 B_0 = 5.7\,cm$

length of input link $A_0 A_1 = 3.2\,cm$

Initial position of input link is 120º e.c.w. with respect to fixed link.

5. a) Derive Freudenstein's equation and explain its significance in context of synthesis of four bar mechanism. **7**

b) $y = \cos x$, $0 < x \leq \pi/2$ **6**
$\Delta\theta = \Delta\phi = 80^o$
$\theta_5 = 40^o$, $\phi_5 = 90^o$
Solve by Freudenstein's Method.

7. a) Explain Powell's Search Method in detail. **7**

b) Explain least square approximation method with example. **7**

OR

8. Design mechanism for door opening and closing with QRR = 1. The mech. is operated by a geared motor. Also determine minimum & max. transmission angles and comment on them. **14**

9. Discuss in detail about Kinematic analysis of spatial mechanism with one example. **13**

OR

10. Describe Kinematic analysis for linkages for various mechanisms like RSSR, RRSS, RCCC with neat sketch. **13**

11. Explain in detail Kinematics synthesis of Robot arms with example. **14**

OR

12. Explain the procedure and steps involved for identification of task of mechanism for robot. **14**

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