SRK/KW/14 – 4170

Eighth Semester B. E. (Aeronautical) Examination

AIRCRAFT MECHANISM : ANALYSIS AND SYNTHESIS

Paper : 8 AE 03

Time : Three Hours] [Max. Marks : 80

N. B. : (1) All questions carry marks as indicated.
(2) Answer **three** questions from Section A and **three** questions from Section B.
(3) Due credit will be given to neatness and adequate dimensionss.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.
(6) Use of non programmable calculator is permitted.

SECTION A

1. (a) What do you Mean by Kinematic inversion ? Explain the inversion of four bar chain with a neat sketch. 6

(b) Explain the terms :—

(i) Function generation

(ii) Path generation

(iii) Motion generation. 6

(c) Define Kinematic analysis and Kinematic synthesis. 2

2. (a) What is Freudenstein's equation ? How is it helpful in designing a four link mechanism when three positions of the input $(\theta_1, \theta_2, \theta_3)$ and the output link $(\varphi_1, \varphi_2, \varphi_3)$ are known ? 9

(b) Explain Harding's notation in detail with a suitable example. 4

3. (a) What is force balancing ? Sketch and explain in detail the force balancing of four – bar mechanism. 10

(b) Define and state the difference between static and dynamic unbalance. 3

4. (a) What are the bearing reactions for the system as shown in fig. 4 (a) if the speed is 750 rev/min ? Also determine the location and magnitude of a balancing mass if it is to be placed at a radius of 0.25 m.

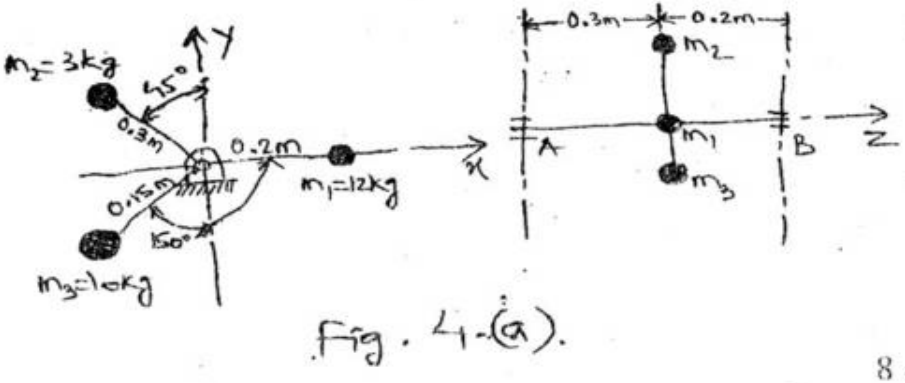

Fig. 4-(a).

8

(b) What are the five methods of force balancing catalogued by Lowen and Berkof ? Enlist the procedure of Berkof and Lowen method. 5

5. (a) What is D–H convention ? What are the basic assumptions and terminology used for D–H convention ? 8

(b) Write a short note on Forward Kinematics. 5

SECTION B

6. (a) State and explain D. Alembert's principle. 7

(b) What do you mean by Dynamically equivalent system ? Explain it with a neat sketch. 7

7. For fynamics of 3–D mecanism prove that

$$\frac{d}{dt}\left(\frac{\partial L}{\partial q_i}\right) - \frac{\partial L}{\partial q_i} + \frac{\partial D}{\partial q_i} = 0$$

where $i = 1, 2, \ldots N$. 13

8. (a) Explain with a neat sketch the flap operating mechanism. 8

(b) What do you mean by Kinematic analysis ? Explain the steps to perform Kinematic analysis. 5

9. (a) Sketch a four bar Mechanism. Explain in detail the inversions of four bar chain. 9

(b) Define and explain the term Kinematic analysis and Kinematic Synthesis. 4

10. Explain with a well labelled diagram the landing gear operating mechanism of an aircraft. 13