

**B.Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

June, 2015

00256

BAS-017 : FLIGHT MECHANICS

Time : 3 hours

Maximum Marks : 70

Note : Answer any **seven** questions. All questions carry equal marks.

1. What do you understand by control reversal ? In design of aircraft, how is aileron control reversal taken care of ? 10

2. (a) During its take-off run, a light aircraft accelerates at 1.5 m/s^2 . It starts from rest and takes 20 sec to become airborne. What is its take-off speed and what length of ground run is required ? 3

- (b) The landing speed of a certain aircraft is 90 knots. If the maximum possible deceleration with full braking is 2 m/s^2 , what length of landing run will be required ? 3

- (c) What thrust is necessary to accelerate an aircraft of 5,900 kg mass from rest to a speed of 90 knots in a distance of 750 m ? 4

3. (a) Explain the phenomena of stalling with the help of a suitable diagram. 5

- (b) What do you understand by the term stability margin ? Explain with the help of a suitable diagram. 5
4. State whether the following statements are *true* or *false* : 10
- (a) A train ascending an incline at a steady speed is in equilibrium.
 - (b) A ramjet has no rotating parts.
 - (c) An aircraft moving at a speed of 200 m/s in a level flight is in a state of equilibrium.
 - (d) When the four main forces (lift, weight, thrust and drag) can be satisfactorily balanced in themselves, the duty of the tail plane is merely to act as a 'stand-by'.
 - (e) For every air speed, as indicated on the air speed indicator, there is a corresponding angle of attack at which level flight can be maintained.
5. (a) What is meant by the centre of pressure of an aerofoil ? Explain briefly. 5
- (b) What is meant by the aerodynamic centre of an aerofoil section ? Explain briefly. 5
6. An aeroplane of 10,000 kg mass is designed with the line of thrust 0.9 m above the line of drag. In normal flight the drag is 18.2 kN and the centre of pressure on the main plane is 150 mm behind the centre of gravity. If the centre of pressure on the tail plane is 10 m behind the centre of gravity, what is the load on the tail plane ? 10

7. (a) Distinguish between 'mass' balance and 'aerodynamic' balance. 5
- (b) What would be the characteristics of an aircraft with extreme lateral stability and little directional stability? 5
8. Explain with graphs, the flight testing methods for determining stick free neutral point. 10
9. An aeroplane of 3000 kg mass is climbing on a path inclined at 12° to the horizontal. Assuming the thrust to be parallel to the path of flight, what is its value, if the drag of the aircraft is 5.0 kN? 10
10. Explain with graphs, the flight testing method for determining stick-fixed neutral point. 10
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