U.S.N.										

B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 20AE5DCBFM **Max Marks: 100**
Course: Basic Flight Mechanics

Instructions: 1. Draw figures/expressions wherever necessary.
2. Assume suitable data wherever necessary.

UNIT - I

1.	a)	Define endurance. Derive an expression for endurance for a jet driven aircraft.	**10**
	b)	Propeller driven aircraft flies at lower altitude, justify the statement. Also mention the necessary conditions for maximum range and endurance of jet propelled aircraft without changing the fuel capacity.	**05**
	c)	Consider the Northrop F-5 fighter airplane, which has a wing area in 16 m^2 and wing span of 7.7 m. The wing is generating 80068 N of lift. For a flight velocity of 112 m/s at standard sea level, Calculate the lift co-efficient, induced drag co-efficient and induced drag. (Assume e = 0.8)	**05**

OR

2.	a)	Derive an expression for turn radius and turn rate.	**12**
	b)	Enumerate drag polar, mention the different types of drag polar.	**08**

UNIT - II

3.	a)	Enumerate the balance field length for take-off.	**12**
	b)	Write short notes on V-n diagram.	**8**

UNIT - III

4.	a)	Derive an expression for tail contribution for longitudinal stability of an aircraft.	**12**
	b)	Elucidate statically stable, unstable and neutrally stable system with an example.	**08**

OR

5.	a)	State the criteria for longitudinal static stability. Explain the same with an illustration.	**12**
	b)	Prove that the neutral point is the aerodynamic center of the complete airplane.	**8**

UNIT - IV

6.	a)	Describe the illustration of aerodynamic moment of elevator – hinge moment.	**10**
	b)	Prove that the free elevator factor $F = 1 - \frac{1}{a_t}\frac{\partial C_{L_t}}{\partial \delta_e}\left(\frac{\partial C_{h_e}/\partial \alpha_t}{\partial C_{h_e}/\partial \delta_e}\right)$	**10**

UNIT - V

7.	a)	Explain main rotor & tail rotor	**14**
	b)	List the major components of helicopter, and list the differences between fixed wing aircraft and helicopter	**06**

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