CBCS SCHEME

USN

BAE602

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Aircraft Performance and Stability

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive the necessary equations which describes the translational and rotational motion of an airplane.	10	L3	CO1
	b.	With neat graph derive an expression for thrust required and condition for minimum thrust required.	10	L3	CO1
		OR			
Q.2	a.	Deduce an expression for equations of motion for rate of climb.	10	L3	CO1
	b.	By using force and velocity diagram of gliding flight obtain the equilibrium velocity along the flight path.	10	L4	CO1
		Module – 2			
Q.3		Derive the three aerodynamic relations which are important for static performance of aircraft and deduce as following statements. $V_{\left(C_L^{3/2}/C_D\right)_{max}} : V_{\left(C_L/C_D\right)_{max}} : V_{\left(C_L^{1/2}/C_D\right)_{max}} = 0.76:1:1.32$	20	L4	CO2
		OR			
Q.4	a.	Derive Brequet Range Equation and state that the maximum range of jet airplane occurs when airplane is flying at $\left(C_L^{1/2}/C_D\right)_{max}$	12	L4	CO2
	b.	Derive the endurance for propeller driven airplane and state the maximum conditions.	08	L2	CO2
		Module – 3			
Q.5	a.	Obtain an expression for S_g and S_a in the take off performance analytically.	14	L4	CO2
	b.	With a neat diagram theoretically describe the intermediate segments of ground roll take off performance.	6	L2	CO2
		OR			
Q.6	a.	What is the touchdown Zone of a runway? How do you calculate the approach distance and flare distance during landing.	10	L4	CO3
	b.	What is meant by ground effects? How do you calculate the ground roll distance in landing performance?	10	L4	CO3

		Module – 4			
Q.7	a.	Derive an expression for wing contribution $\left[\frac{dc_M}{dc_l}\right]_W$ for the longitudinal static stability of an airplane and discuss the significance of C.G position with respect to aerodynamic centre.	10	L3	CO3
	b.	Explain the terms of equilibrium conditions, static stability, longitudinal static stability and stability criteria with relevant equations and graphs.	10	L2	CO3
		OR			
Q.8	a.	Define stick fixed neutral points. Write down the expression for stick fixed neutral point and discuss the effect of C. G shift on pitching moment.	6	L3	CO3
	b.	Briefly explain about longitudinal control.	8	L2	CO4
	c.	Define Elevator Power and how does elevator power affects the longitudinal stability.	6	L2	CO4
		Module – 5			
Q.9	a.	Explain Hinge Moment Parameters.	6	L2	CO3
	b.	Explain about Trim Tabs.	6	L2	CO4
	c.	Derive the equation for stick free neutral points.	8	L3	CO4
		OR			
Q.10	a.	Define static directional stability of an airplane and the criteria with the relevant sketches and expressions.	6	L2	CO4
	b.	Explain about Adverse Yaw and Spin Recovery.	8	L2	CO4
	c.	Explain about 'Rudder Lock' and 'Dorsal Pin'.	6	L2	CO4

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