CBCS SCHEME - Make-Up Exam

USN | | | | | | | | | | |

BAE602

Sixth Semester B.E/B.Tech. Degree Examination, June/July 2025
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
1	a.	Describe the Forces acting on the aircraft, with a neat sketch and obtain the equation of motion to describe the translational motion of an aircraft.	10	L2	CO1
	b.	Calculate the power required for an aircraft at 40000 ft and draw the power required curve by considering velocity from 300 to 1200 ft/s with the following data : $P_\infty = 5.87\times10^{-4}$ slug/ft^3; W = 83000 lb; S = 900 ft^2; AR = 5.92; $C_{DO} = 0.025$; K = 0.09 Draw the curve and obtain the minimum power required and velocity at minimum power required.	10	L4	CO1
		OR			
2	a.	Derive the relation for $\frac{C_L}{C_D}$, $\frac{C_L^{\frac{3}{2}}}{C_D}$, $\frac{C_L^{\frac{1}{2}}}{C_D}$ relations and respective velocity relations for all the above cases.	10	L3	CO1
	b.	Obtain the expression for velocity and $\frac{R}{C}$ for maximum climb angle for jet-propelled airplane using analytical approach and discuss the important parameters.	10	L3	CO1
		Module – 2			
3	a.	Derive the expression for drag polar and also explain about the drag reduction methods with neat sketch.	10	L2	CO1
	b.	Obtain appropriate relation for velocity associated with $\left(\frac{L}{D}\right)_{max}$ and maximum endurance for any type of engine to $\left(\frac{L}{D}\right)_{max}$.	10	L3	CO1
		OR			
4	a.	Using the Breguet Range equation, obtain the relation for propeller driven and jet propelled airplanes.	10	L2	CO1
	b.	What is headwind and Tailwind in aircraft? Discuss the effect of them using necessary graphs.	10	L1	CO1

		Module – 3			
5	a.	Estimate the required data using the expression for calculation of distance while airborne to clear an obstacle of an jet aircraft.	**10**	**L2**	**CO2**
	b.	Obtain the expression for approach distance and flare distance for an aircraft during landing.	**10**	**L2**	**CO2**
		OR			
6	a.	Draw and explain about level turn and obtain the expression for turning radius and turning rate.	**10**	**L2**	**CO2**
	b.	Derive an equation for calculation of ground roll for taking off during aircraft phase.	**10**	**L3**	**CO2**
		Module – 4			
7	a.	Derive the expression for the wing contribution $\left(\frac{dC_m}{dC_L}\right)$ wing to the longitudinal static stability of an aircraft and discuss the significance of C.G position with respect to the $X_{a.c.}$	**12**	**L3**	**CO3**
	b.	Discuss the concept of static and dynamic stability with relevant expressions and diagrams.	**8**	**L1**	**CO3**
		OR			
8	a.	Discuss elevator control power and derive an expression for it.	**10**	**L2**	**CO3**
	b.	Discuss the concept of stick fixed longitudinal static stability. Also write the relevant equations for stick fixed neutral point estimation.	**10**	**L2**	**CO3**
		Module – 5			
9	a.	Briefly explain hinge moment parameters and trim tabs.	**6**	**L2**	**CO4**
	b.	Explain the various methods of aileron balancing.	**8**	**L2**	**CO4**
	c.	Write a note on Rudder lock and dorsal fin.	**6**	**L1**	**CO4**
		OR			
10	a.	Obtain an expression for roll control power $C_{L\delta a}$.	**10**	**L3**	**CO4**
	b.	Discuss static directional stability of an airplane and the criteria with relevant sketches.	**6**	**L2**	**CO4**
	c.	Write a note on : (i) Adverse yaw (ii) Asymmetric power.	**4**	**L1**	**CO4**

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