

Model Question Paper-1/2 with effect from 2022-23 (CBCS Scheme)

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Sixth Semester B.E. Degree Examination Aircraft Performance and Stability(BAE602)

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02.

| Module -1 | | | *Bloom's Taxonomy Level | Marks |
|-----------|---|--|-------------------------|-------|
| Q.01 | a | For the Gulfstream IV at the conditions given below, calculate and plot thrust required curve at velocities 300, 600, 900 and 1300ft/s it occurs. Given $W = 73000$ lb, $S = 950\text{ft}^2$, density $\rho_{\infty}=8.9068*10^{-4}\text{slug/ft}^3$, $C_{D,0}=0.015$ and $K=0.08$, $AR=5.92$? | 4 | 10 |
| | b | Define four forces of flight. Derive the equations of motion of an airplane through three -dimensional space over a flat earth. | 4 | 10 |
| OR | | | | |
| Q.02 | a | Calculate the power required curve @ 30,000 ft with the following data $W = 73000$ lb, $S = 950\text{ft}^2$, density $\rho_{\infty}=8.9068*10^{-4}\text{slug/ft}^3$, $AR = 5.92$, $C_{D0} = 0.015$, $K = 0.08$ and plot the graph. | 3 | 10 |
| | b | Derive an expression for thrust required for an unaccelerated flight | 4 | 10 |
| Module-2 | | | | |
| Q. 03 | a | Derive the equation for rate of climb | 4 | 10 |
| | b | Consider the Gulf stream 4 flying at 30000ft and at sea level, assume a total loss of engine thrust calculate, a) Minimum glide path angle b) Maximum range covered. c) The corresponding equilibrium velocity. Given: $(L/D)_{\text{Max}}=14.43$, density $\rho_{\infty}=8.9068*10^{-4}\text{slug/ft}^3$, $K=0.08$, $C_{D,0}0.015$, $\rho_{\text{sea level}}=0.002377$ slug/ft ³ , $W=73000$ lb, $S=950$ ft ² | 4 | 10 |
| OR | | | | |
| Q.04 | a | Derive the equation for rate of sink or vertical downward velocity | 4 | 10 |
| | b | For the unpowered Gulfstream 4 at 30000ft, calculate a) The sink rate for the case of minimum glide angle b) Minimum sink rate | 3 | 10 |
| Module-3 | | | | |
| Q. 05 | a | Derive general equation of range and derive equation for propeller driven aircraft | 4 | 10 |
| | b | Estimate maximum range for gulfstream 4 twin turbo executive transport, Max usable fuel is 29500 lb, the thrust specific fuel consumption (C_t) at 30000ft is 0.69 lb/hr. Given $W_0 = 73000$ lb, $S = 950\text{ft}^2$, density $\rho_{\infty}=8.9068*10^{-4}\text{slug/ft}^3$, $(C_L^{1/2}/C_D)_{\text{Max}}=25$. | 3 | 10 |
| OR | | | | |
| Q. 06 | a | Derive general equation of Endurance and write the conditions for max endurance for propeller driven aircraft. | 4 | 10 |
| | b | Derive equation of range for jet propelled aircraft and write the condition for maximum range. | 4 | 10 |
| Module-4 | | | | |
| Q. 07 | a | Derive the equation for wing contribution in Static longitudinal stability. | 4 | 10 |

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| | b | Derive Fuselage contribution Equations for static longitudinal stability. | 4 | 10 |
| OR | | | | |
| Q. 08 | a | Derive Equations of tail contribution for longitudinal static stability. | 4 | 10 |
| | b | Derive equation for stick fixed neutral point. | 4 | 10 |
| Module-5 | | | | |
| Q. 09 | a | Write a note on one engine inoperable condition for directional stability. | 3 | 10 |
| | b | Write a note on dihedral effect in roll stability. | 3 | 10 |
| OR | | | | |
| Q. 10 | a | Write a note on weather locking effect. | 3 | 10 |
| | b | Write the requirements for directional control. | 3 | 10 |