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BAS-023

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B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2012

BAS-023 : AIRCRAFT DESIGN/LAUNCH VEHICLE/ ROCKET DESIGN

Time : 3 hours *Maximum Marks : 70*

Note : *(1) Question No. **1** is compulsory.*

*(2) Attempt **any 6** questions from q. no. 2 to q.no 9.*

1. Attempt ***any five*** of the following : **5x2=10**

(a) Describe the effect of dihedral of the wing.

(b) What is stalling Velocity ? Establish it's relation with wing loading.

(c) What is the effect of Leading Edge Sweep Back on an airplane wing ?

(d) Explain in brief the static margin.

(e) How are Centre of Pressure and Aerodynamic Centre different ?

(f) Arrange Turbo - Prop, Afterburning Turbo - Prop, low bypass Turbo - fan and High bypass Turbo - fan engine in decreasing order of their specific Fuel Combustion.

2. Describe in detail the Tree of an Airplane Design Process. 10

3. What data do you need to make the first estimate of take - off weight ? Clearly describe how you make the estimation. 10

4. (a) What are the working Mach no. Regimes of different engines used in Aircrafts ? 6

(b) What is the necessity/advantage of Afterburning in an aircraft gas turbine engine ? 4

5. What is the effect of following on performance of airfoil ? 5x2=10

(a) Thickness to chord Ratio (t/c).

(b) Maximum thickness.

(c) Location of Maximum thickness

(d) Leading Edge Radius.

(e) Location of Maximum Camber.

6. What is the function of a tail in the aircraft ? Draw different kinds of tail arrangements commonly used in airplanes clearly describing usage/merits/demerits of each. 10

7. (a) How various high lift devices affect maximum lift coefficient ? Compare their effect quantitatively. 6

(b) Define design lift coefficient for a civil jet aircraft. How will you estimate the maximum lift coefficient for such an aircraft ? 4

8. Elaborate design and structural features of Airbus A - 380. Comment on the use of new technologies used in this airplane. 10

9. In order to calculate initial estimates of an airplane thrust-to-weight ratio, the following data is given: Total Take-off weight. $Wo = 35413$ kg, Wing Ref. Area, $S = 75$ m^2 , Wing Loading, $(W/S) = 472$ kg/m^2 . The airplane cruise speed is $V = 210$ m/s . Assume a wing aspect ratio, $AR = 9.0$, Profile Drag Co-efficient, $C_{DO} = 0.024$, fuel equal to 2% of Wo burnt during climb, and rate of climb, $R/C = 2$ m/s, Determine the following : 10

(a) Drag Profile

(b) Cruise lift Co - efficient.

(c) Drag generated

(d) Flight path angle.

(e) Thrust / weight required.

Assume Oswald's wing efficiency factor, e = 0.89.

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