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BAS-023

B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

June, 2013

01640

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*** *from no.* ***2-9.***

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

(a) Explain the formation of wing-tip vortices. Which type of drag they are associated with ?

(b) How Laminar flow airfoil geometry is different from a Conventional airfoil ?

(c) Bring out any two important differences between shock waves and expansion waves in a Supersonic flow.

(d) Describe the effect of leading edge radius of an airfoil.

(e) Why the engines are generally placed closer to the fuselage ?

(f) Draw drag polar for a positively cambered airfoil.

2. (a) Frame specifications for an airplane for medium range with 350 Passengers with a cruise speed of 950 km/h. Make use of sketches and plot to illustrate your answer. 5

(b) Compare air load distribution over a rectangular wing with an elliptic wing. Which one of these is superior and how? Which of these has higher numerical value of Oswald wing efficiency factor? 5

3. (a) What are Possible locations of Jet engines on an airplane (both civil and military) ? Illustrate each of these with sketches/ diagrams of existing/past airplanes. 7

(b) What are the types of compressors used in Gas turbine Engines ? Compare them with respect to their advantages/disadvantages. 3

4. A small turbo-Prop aircraft is designed for a Range of 1000 km. The crew weight is 400 kg and payload weight is 1000 kg. The aircraft cruises at mach 0.6 at an altitude of 7 km, where the speed of sound can be taken to be 312 m/s. The maximum value of (L/D) is 16. Calculate the total take-off weight of the aircraft if the specific fuel consumption of 0.015 grams per newton per second. Assume empty weight fraction relation We/Wo=0.62. 10

5. What is the effect of following features of a wing ? 5x2=10

(a) Leading Edge Sweep

(b) Taper Ratio

(c) Aspect Ratio

(d) Wing Tips

(e) Dihedral

6. (a) What is the effect of stall speed and wing loading on Take-off and Landing performance ? 5

(b) Compare a high wing commercial airplane configuration with a low wing configuration. What are the aerodynamic and structural features of these two types of airplanes ? 5

7. Describe the methodology involved in determination of Drag of an Airplane wing. Support it with sketches. 10

8. Elaborate design and structural features of TEJAS, The HAL built LCA. Comment on the use of materials used for manufacturing this military airplane. 10

9. (a) How various high lift devices affect maximum lift co-efficient ? Compare their effect quantitatively. **6**

(b) Explain in brief the 'V-n diagram' with the help of sketches. **4**