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BAS-023

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B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

June, 2014

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

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions. All questions carry **equal** marks. Use of scientific calculator is **permitted**.*

1. (a) Describe the FLYING WING airplane (of Northrop origin). How does this airplane get its static/dynamic longitudinal stability ? Illustrate with sketches/diagrams and plots. 5

   (b) What is understood by the term 'STEALTH TECHNOLOGY' ? Name one such airplane and explain its stealth action. 5

2. Justify your choice of the location of the wing of an airplane from the following : 10

   (a) High wing

   (b) Low wing

   (c) Mid wing

   Discuss the design for a commercial long range jetliner on the basis of aerodynamics, structures, propulsions and other considerations. Make use of sketches/diagrams and plots to support your choice.

3. Describe with representative sketches/diagrams of various tail plane configurations deployed on airplane for stability purposes. Explain from aerodynamics why twin vertical tails are often employed on high speed airplanes having swept back wings with high maneuverability. **10**

4. Describe the structural layout and details of an all metal fuselage of a commercial jetliner Air Bus A-320 with low wing attachment. Hence illustrate the complete role of each structural member in providing strength and stiffness in resisting air loads, dead loads and the moments of the wing and tail attachments. Make use of sketches/diagrams to illustrate your points. **10**

5. (a) Make use of representative sketches/ diagrams to describe the design features of F-16 on the basis of its : **5**
   (i) Aerodynamics
   (ii) Structure
   (iii) Power plant and the air intake
   (b) What are the salient design features of HAL designed and built Pushpak trainer ? Make use of sketches and plots. **5**

6. You are to frame a proposal for the conceptual design of four seater airplane for highway police surveillance. The basic minimum requirements projected are : **10**
   (a) Cruise velocity of 300 kmph at an altitude of 2000 m.
   (b) 400 HP piston prop engine
   (c) To run (from unprepared runway) of 100 m.

(d) State of the art radio and satellite communication equipment 50 kgs
(e) Nose wheel type fixed LG
(f) All metal (plus composites) rugged structure comment on the usefulness of the specifications.

7. (a) Explain the role of Aircraft mock up in the design and development of a new airplane. Illustrate with emphasis on structural arrangement, layouts and systems deployment. 5

(b) What should be the design features of a low cost trainer airplane requiring minimum maintenance and operational cost ? 5

8. What is the effect on the following in the performance of an 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.

9. 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