Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 170101 Date: 26/12/2012

Subject Name: Aircraft Design-I

Time: 10.30 am – 01.00 pm Total Marks: 70

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** By referring mentioned figure answer below mentioned questions. **07**

1. What type of aircraft is this?
2. What speed it can fly? Subsonic/ Supersonic/hypersonic.
3. Type of wing configuration? Sweep back/ taper/ delta etc.?
4. Approximate seating capacity-
5. Expected type of engine-
6. Expected T/W ratio or Hp/W ratio-
7. Expected Wing loading- lbs/ft²

(b) By referring mentioned figure answer below mentioned questions. **07**

1. Name Primary control surfaces.
2. Mention integrated control surfaces.
3. Location of wing- High/ low/ mid/ bi-plane etc.
4. Landing gear configuration- tricycle-tail dragger-multi boogie.
5. Expected type of control system-cable/hydraulic/fly by wire.
6. Type of wing- fix/rotating/variable sweep etc.
7. Your suggestion about performance enhancement.

Q.2 **(a)** By referring mentioned figure answer below mentioned questions. **07**

1. Is preferable pitching control surface is elevator or stabilator?
2. What modification is required to improve radar detectability?
3. Mention secondary control surfaces-
4. If one more engine is to be placed, where will you locate?
5. Mention induce drag reduction technic applied in this aircraft.
6. Mention parasite drag reduction technic applied in this aircraft
7. Mention technic to improve lateral stability-

(b) A bomber aircraft is having maximum take-off weight of 140000 lbs. what will be fuselage length and thrust/weight ratio if its maximum speed is 0.82 mach. What should be basic empty weight of aircraft? **07**

Data for bombers	a	c
For fuselage length vs Wo	0.23	0.5
T/Wo ratio vs M_{max}	0.244	0.341
We/Wo vs Wo	0.93	-0.07

OR

(b) What is the importance of control surface integration? In multi role aircrafts what type of integration is observed among primary and secondary control surfaces? **07**

Q.3	**(a)**	Explain different types of fuel weights.	**07**
	(b)	Define basic empty weight, useful load, payload, fuel weight, maximum takeoff weight, maximum ramp weight, maximum zero fuel weight.	**07**

OR

Q.3	**(a)**	With respect to fuselage and wings what considerations are to be taken to place nose wheel and main landing gear? How will you determine diameter of main and nose wheel	**07**
	(b)	How Refine weight estimation method is useful to an aircraft designer?	**07**
Q.4	**(a)**	What are relationship between propeller diameter and horsepower? What are difference between T/Wo of personal utility aircraft and a sports plane?	**07**
	(b)	If you are designing a supersonic ground attack aircraft, Enlist considerations you will take.	**07**

OR

Q.4	**(a)**	How will you calculate dimensions of horizontal stabilizer and canard?	**07**
Q.4	**(b)**	How will you produce Mean Aerodynamic Chord? How will you locate C.G. with respect to Geometric Aerodynamic Centre and Centre of Pressure?	**07**
Q.5	**(a)**	Which considerations are taken to design fuselage of Cargo and Public transport aircraft.	**07**
	(b)	How will you decide wing plan form shape? In case of high subsonic aircraft what consideration are to be taken to decide sweep back angle.	**07**

OR

Q.5	**(a)**	If you want to attach hard points with aircraft what consideration will you take to locate weapons?	**07**
	(b)	Explain importance of different types of tail plane configurations. Explain with neat sketch.	**07**

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