Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2170101 Date:18/11/2016

Subject Name:Aircraft Design I

Time:10.30 AM to 1.00 PM Total Marks: 70

Instructions:

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

Short questions 14

Q-1
1. During which maneuver maximum thrust is required?
2. What is relationship between L/D for cruise and L/D for loiter in prop driven aircraft?
3. Only draw a flight envelop of a deep penetration spy plane.
4. What is importance of ventral fin?
5. How will you reduce form drag of a fixed landing gear where retraction is not possible?
6. What is the relationship between fraction of span and fraction of chord of aileron design?
7. Answer in only one sentence why stabilator is used in supersonic airplanes instead of horizontal stabilizer?
8. What is importance of vortex generator?
9. Why undercarriage is placed between fuselage and engine pylon in jet transport aircraft and not outboard side?
10. What is expected sweep back angle of the wing of any aircraft flying with cruise speed of 0.78 Mach?
11. What is the best airfoil of main wing of a piston prop aerobatic sports or air display aircraft?
12. What is the solution if shock wave is observed on the root of a vertical fin at the speed of 0.85 Mach? Which changes will you carryout in design of vertical fin?
13. What types of flaps will you prefer for aircrafts having higher side wing loadings?
14. Why deflection is required in horizontal stabilizer of aircrafts flying in transonic range.

Q-2 (a) What is co relationship among sweep back angles of wing, horizontal stabilizer, vertical fin, dorsal fin, ventral fin in aircraft flying with speed of transonic range? 03

(a) Discuss how will you choose either Sweep back or Delta wing for supersonic jet fighter application? 04

(b) Suppose you want to convert a supersonic conventional jet fighter into VTOL which changes will you conduct in aircraft design. 07

OR

	(b)	Explain how you will determine fuel mass and fuel volume required for particular flight envelope.	07
Q-3	(a)	What is importance of wing twist in high aspect ratio sweepback wing configuration?	03
	(b)	Discuss maneuvering techniques of a tandem rotor helicopter.	04
	(c)	Explain cyclic pitch and collective pitch control in brief with neat sketches.	07

OR

	(a)	How will you determine payload for the aircraft conducting long range flight?	03
	(b)	Explain method to determine turning radius of aircraft while taxing on ground.	04
	(c)	How will you choose type of engine with respect to Never Exceed Speed?	07
Q-4	(a)	Explain how tail rotor supports maneuvering of a conventional helicopter?	03
	(b)	Explain how to determine track and base distance of landing gears.	04
	(c)	Differentiate between rotary wings and fix wing aircrafts.	07

OR

	(a)	How will you determine load acting upon wheels of aircrafts when aircraft is fully loaded with payload and fuel?	03
	(b)	Only draw any type of plan form shaped wing and mention Mean Aerodynamic Chord, Geometric Aerodynamic Centre, Root Chord, Tip Chord, C.G Range and Neutral Point.	04
	(c)	Discuss different rotor configurations with neat sketches.	07
Q-5	(a)	Why cambered vertical fin and stabilizer are provided in some conventional helicopters?	03
	(b)	Discuss tail plane control surface sizing.	04
	(c)	Discuss classifications of aircraft.	07

OR

	(a)	Why supersonic jet fighters are having less wing loading than jet transport aircrafts?	03
	(b)	Suppose you want to convert single engine piston prop aircraft into jet plane configuration how will you convert Hp/W_o from T_{max}/ W_o Ratio?	04
	(c)	Write down procedure to design wing geometry of a public transport jet aircraft.	07

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