Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2022

Subject Code:3170113 Date:16-01-2023

Subject Name:Helicopter Engineering

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Describe the degree of freedom of rotor blade.	**03**
	(b)	State the technical differences between a rotory wing aircraft and a fixed wing aircraft.	**04**
	(c)	Explain the velocity distribution over a helicopter rotor in forward flight and hover. A neat sketch of both is compulsory.	**07**
Q.2	**(a)**	List all the characteristics of an Airfoil for a rotor.	**03**
	(b)	Define the following term. 1)Downwash Angle 2)Inflow ratio 3)Power loading 4)Disk loading	**04**
	(c)	Define mass flow rate and derive an equation of induced velocity for high climb conditions.	**07**
		OR	
	(c)	Using blade element theory, derive the equation of induced velocity for high climb conditions.	**07**
Q.3	**(a)**	Difference between cyclic and collective pitch.	**03**
	(b)	Write short notes on figure of merit and blade loading coefficients.	**04**
	(c)	Explain Anti torque system failure.	**07**
		OR	
Q.3	**(a)**	Why does twist provided on main rotor?	**03**
	(b)	Discuss various Airfoil section used for main rotors.	**04**
	(c)	Explain in detail about the flow patterns in axial flight with sketches , graph and its explanation.	**07**
Q.4	**(a)**	How will you modify wing tip if found it touches transonic speed?	**03**
	(b)	Discuss climb power ,induce power and parasitic power.	**04**
	(c)	Explain the distribution of power consumptions with respect to flight speed. Describe the role of each of the power with respect to flight condition.	**07**
		OR	
Q.4	**(a)**	How will you Determine tail rotor power requirement.	**03**
	(b)	What are difference between power Required while hovering and cruising.	**04**
	(c)	Explain Stability augmentation system.	**07**
Q.5	**(a)**	What are the main part of helicopter rotor?	**03**

	(b)	State the effects of too far forward C.G in helicopter.	**04**
	(c)	Explain centrifugal clutch with figure	**07**
		OR	
Q.5	**(a)**	Explain Autorotation and ground effect.	**03**
	(b)	Define the coriolis force and induced velocity.	**04**
	(c)	Write the weight and balance data needed to determine proper loading of helicopter.	**07**

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