Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(OLD) – EXAMINATION – SUMMER 2019

Subject Code:160202 **Date:29/05/2019**

Subject Name: Automobile Heat Transfer

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.**

Q.1	**(a)**	Derive an expression for one-dimensional steady-state heat conduction from composite wall with three layers.	**07**
	(b)	Discuss the various regimes of boiling and explain the condition for the growth of bubbles.	**07**
Q.2	**(a)**	Explain the significance of fin efficiency and effect of Biot number on fin effectiveness.	**07**
	(b)	Explain the circumstances under which natural convection occurs. Differentiate between natural and forced convection.	**07**
		OR	
	(b)	Derive Von-Karman integral momentum equation for hydrodynamic boundary layer over a flat plate.	**07**
Q.3	**(a)**	State and explain Wien's displacement law.	**07**
	(b)	A wire of 6.5mm diameter at a temperature of 60°C is to be insulated by a material having k=0.174W/m°C.Convection heat transfer coefficient (h_o)=8.722W/m^2°C.The ambient teparature is 20°C.For maximum heat loss, what is the minimum thickness of insulation and heat loss per meter length? Also find % increase in heat dissipation too.	**07**
		OR	
Q.3	**(a)**	Briefly explain the significance of following dimensionless numbers. Reynolds number and Prandtl number.	**07**
	(b)	Explain heat exchanger effectiveness, fouling and NTU.	**07**
Q.4	**(a)**	Write a short note on heat pipe stating principle of operation, types and applications.	**07**
	(b)	Explain with a neat sketch construction of a radiator.	**07**
		OR	
Q.4	**(a)**	Discuss the modes of condensation. Why dropwise condensation is preferred?	**07**
	(b)	Assuming the sun to be a black body having a surface temperature of 5800K,calculate (a) the total emissive power,(b) the wavelength at which the maximum spectral intensity occurs,(c) the maximum value of $E_{b\lambda}$,(d) the total amount of radiant energy emitted by the sun per unit time if its diameter can be assumed to be 1.391 x 10^9m.	**07**

Q.5 **(a)** Derive the expression for fin efficiency for a fin insulated at the tip. **07**

(b) In a counter flow heat exchanger,flue gases at 800°C(C_p = 1.1kJ/kgK) with flow rate of 4kg/sec.The air on other side is flowing with 6 kg/sec at 400°C inlet tempwrature and 551.5°C at outlet.Take U = 100W/m^2k. Determine: (a) heat transfer area needed and (b) NTU **07**

OR

Q.5 **(a)** Derive the expression for LMTD for parallel flow heat exchangers. **07**

(b) What is a radiation shield? When it is used? Also write the expression for radiation heat transfer between two parallel plates with one shield. **07**

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