Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) EXAMINATION – WINTER 2018

Subject Code:160202 **Date: 15/12/2018**

Subject Name: Automobile Heat Transfer

Time: 02:30 PM TO 05:00 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)** Write down general heat conduction equation for Cartesian co-ordinate and derive equation for heat transfer through a plane wall. **07**

(b) What is convection? Explain types of convection and explain newton's law of cooling. **07**

Q.2 **(a)** "It is true that insulation is provided to reduce heat transfer rate but due to insulation heat transfer rate is not reduced always" Justify the statement analytically. **07**

(b) Explain hydrodynamic (velocity) boundary layer. **07**

OR

(b) A wall of a furnace is made up of inside layer of silica brick 120 mm thick covered with a layer of magnesite brick 240 mm thick. The temperature at the inside surface of silica brick wall and outside surface of magnesite brick wall are 725°C and 110°C respectively. The contact thermal resistance between the two walls at the interface is 0.0035°C/W per unit wall area. If thermal conductivities of silica and magnesite bricks are 1.7 W/mK and 5.8 W/mK, **07**

Calculate

1. Rate of heat loss unit area of wall
2. Temperature drop at the interface.

Q.3 **(a)** Derive an expression for heat flow through 'Rectangular Fin'. **07**

(b) The resistance R experienced by a partially submerged body depends upon the velocity V, length of the body L, viscosity of fluid μ, density of fluid ρ and gravitational acceleration g. Obtain a dimensionless expression for R using Buckingham π method. **07**

OR

Q.3 **(a)** Write a short notes on the following: (A) Total emissive power, (B) Irradiation, (C) Radiosity, (D) Gray Body. **07**

(b) Assuming the sun to be a black body having a surface temperature of 5800 K, calculate (a) 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 1.391×10^{9} m. **07**

Q.4 **(a)** Derive an expression for LMTD in case of counter flow heat exchanger. **07**

(b) An oil of 0.27 kg/sec (C_p= 2.09 kJ/kg K) has to be cool from 80°C to 40°C using coolant flow of 0.27 kg/sec (C_p= 4.18 kJ/kg K) at 30°C. Give your choice for selection of heat exchanger with reason. Calculate the area of heat exchanger. **07**

OR

Q.4	**(a)**	Derive formula for effectiveness of parallel flow heat exchanger.	**07**
	(b)	What do you mean by fouling? State the causes of fouling.	**07**
Q.5	**(a)**	What is the function of radiator in an automobile? Explain with a neat sketch construction and working of a radiator.	**07**
	(b)	What is boiling? Explain boiling regimes.	**07**

OR

Q.5	**(a)**	What are the functions of cap which is used on a radiator? Explain construction and working of a radiator cap.	**07**
	(b)	What is condensation? Explain film wise condensation and drop wise condensation.	**07**

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