

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER- VI (Old) EXAMINATION – WINTER 2019****Subject Code: 160202****Date: 16/12/2019****Subject Name: Automobile Heat Transfer****Time: 02:30 AM 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) Distinguish between the conduction, convection and radiation heat transfer. **07**
(b) Derive the general heat conduction equation in Cartesian coordinates. **07**

- Q.2** (a) Explain the following terms. **07**
a) Efficiency of fin
b) Effectiveness of fin
c) Biot number
(b) Write a short on Radiator used in Car including construction, working and application. **07**

OR

- (b) It is required to heat oil to about 300 °C for frying purpose. A ladle is used in the frying. The section of the handle is 5 mm x 18 mm. the surrounding are at 30 °C. The conductivity of the material is 205 W/m°C. If the temperature at a distance of 380 mm from the oil should not reach 40 °C, determine the convective heat transfer coefficient. **07**

- Q.3** (a) Write short notes on the following: (a) Absorptivity, (b) Grey body, (c) Intensity of radiation and, (d) Black body. **07**
(b) Derive Von-Karman integral momentum equation for hydrodynamic boundary layer over a flat plate. **07**

OR

- Q.3** (a) The effective temperature of a body having an area of 0.12 m² is 527 °C. Calculate the following: **07**
1. The total rate of energy emission
2. The intensity of normal radiation
3. The wavelength of maximum monochromatic emissive power.
(b) State any three laws of radiation. **07**

- Q.4** (a) What are the functions of cap which is used on a radiator? Explain construction and working of a radiator cap. **07**
(b) In a Counter flow type double pipe, HE, water is heated from 25 °C to 65 °C by an oil with specific heat 1.45 KJ/kg K and mass flow rate of hot water is 0.9 KJ/s. the oil is cooled from 230 °C to 160 °C. If the overall HT coefficient is 420 W/m² °C. Calculate, the rate of Heat transfer, the mass flow rate of water and the surface area of Heat exchanger. **07**

OR

- Q.4** (a) Explain the following terms: **07**
a) NTU

b) Effectiveness of heat exchanger.

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c) Overall heat transfer coefficient.

- (b) Derive an expression for logarithmic mean temperature difference (LMTD) for Parallel flow heat exchanger. 07

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) Explain the circumstances under which natural convection occurs. Differentiate between natural and forced convection. 07

OR

Q.5 (a) Using Buckingham's π theorem, show that the free convection is given by $Nu = \phi (Gr.) (Pr.)$ 07

- (b) Write a short note on heat pipe stating principle of operation, types and applications. 07

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