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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**M.Tech I Year II Semester Regular Examinations October-2020**

**ADVANCED HEAT TRANSFER**

(Thermal Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 Derive a general heat conduction equation in spherical coordinates. 12M

**OR**

- 2 Two walls, 1m apart are connected by a metal rod of 2.5cm in diameter ( $k= 25\text{W/m K}$ ). The temperature of one wall is  $1000^{\circ}\text{C}$  and that of the other wall is  $500^{\circ}\text{C}$ . A fluid of  $300^{\circ}\text{C}$  is flowing through the space between the walls. The heat transfer coefficient of the fluid is  $25\text{ W/m}^2\text{ K}$ . Find 12M

- i) Find the heat transferred from the surface of the rod and  
ii) The position and value of minimum temperature in the rod.

**UNIT-II**

- 3 Derive expressions for boundary layer thickness and local skin friction coefficient following the Blasius method of solving laminar boundary layer equations for flat plate. 12M

**OR**

- 4 Explain the concept of velocity distribution for a laminar flow through pipes with equation and neat sketches. 12M

**UNIT-III**

- 5 Explain about film wise condensation and drop wise condensation. 12M

**OR**

- 6 A vertical plate 350mm high and 420mm wide, at  $40^{\circ}\text{C}$ , is exposed to saturated steam at 1atm. Calculate the following: 12M

- i) The film thickness at the bottom of the plate  
ii) The maximum velocity at the bottom of the plate  
iii) The total heat flux to the plate

Assume vapour density is small as compared to that of the condensate

**UNIT-IV**

- 7 Derive an expression for LMTD in the case of counter- flow heat exchanger. 12M

**OR**

- 8 What is a heat exchanger? How are heat exchangers classified? 12M

**UNIT-V**

- 9 Two very large parallel plates with emissivity 0.5 exchange heat. Determine the percentage reduction in the heat transfer rate if a polished aluminum radiation shield of emissivity = 0.04 is placed in between the plates. 12M

**OR**

- 10 Explain the concept of radiation exchange through radiation shields. 12M

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