Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, DECEMBER 2020

SUBJECT: COMBUSTION AND HEAT TRANSFER [AAE4151]

REVISED CREDIT SYSTEM

(28/12/2020)

Duration: 3 Hours Max. Marks: 50

Instructions to Candidates:

- **Answer all the question compulsory.**
- **Missing data may be suitably assumed.**
- **Use of Heat and Mass transfer Data Hand Book is allowed.**

1A) What is deflagration flame? **(02)**

1B) With a neat sketch, Discuss on various stages of combustion in CI engine. **(04)**

1C) With appropriate assumptions, obtain an expression for the temperature distribution across a hollow cylinder made of a material having a constant thermal conductivity 'K'. **(04)**

2A) A hollow sphere is made up of steel having thermal conductivity of 45W/m^{0}C. It is heated by means of coil of resistance 100Ω which carries a current 5A. The coil is located inside the hollow space at the center. The outer surface area of the sphere is 0.2m^2 and its mass is 32kg. Assuming the density of the sphere material as 8000kg/m^3, calculate the temperature difference between the inner and outer surfaces. **(03)**

2B) With appropriate assumptions, obtain an expression for the heat transfer at the base of a uniform straight fin having an isothermal tip. **(05)**

2C) State the Newton's law of cooling and define the convective heat transfer co-efficient. **(02)**

3A) Describe the concept of fouling factor in heat exchangers. **(03)**

3B) A refrigerator is designed to cool 250kg/hr of hot liquid of C_p = 3350 J/kgK at 120^{0}C using parallel flow arrangement.1000kg/hr of cooling water is available for cooling purpose at a temperature of 10^{0}C.If the overall heat transfer coefficient is 1160W/m^{2}K and the surface area of the heat exchanger is 0.25m^2, Calculate the outlet temperature of cold liquid and hot liquid .Find the effectiveness of heat exchanger. **(05)**

3C) What is the significance of no-slip zone in convection heat transfer? **(02)**

4A) Engine oil at 80^0C flows over a 6m long flat plate whose temperature is 30^0C with a velocity of 3 m/s .Determine the total drag force and the rate of heat transfer over the entire plate per unit width. **(05)**

4B) Write a note on types of condensation. **(03)**

4C) State any four advantages of dimensional analysis. **(02)**

5A) State Kirchhoff's Law. Also define (a) Absorptivity (b) Total emissive power. **(04)**

5B) Water is boiled at the rate of 25kg/h in a polished copper pan, 280mm in diameter, at atmospheric pressure .Assuming nucleate boiling conditions, calculate the temperature of the bottom surface of the pan. **(04)**

5C) Discuss the significance of prandtl number and Grashoff number. **(02)**