(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] DECEMBER 2019

Paper Code: ETAT-305 **Subject: Heat Transfer and I.C. Engines**

(2013 Onwards)

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q. No. 1 which is compulsory. Select one question from each Unit.

(2.5x10=25)

Q1 (a) How is the subject heat transfer different from that thermodynamic?

(b) Discuss the significance of critical thickness of insulation.

(c) Define the Nusselt number. Why is it important?

(d) What do you understand by thermal boundary layer?

(e) Write down the merits of dropwise condensation. Which of the two condensation give a higher heat transfer coefficient? Why?

(f) Two parallel infinite black plates are maintained at 200°C and 300°C. What will be the net heat transfer rate between the plates per unit area?.

(g) Under what conditions, NTU method is used for the design of heat exchangers?

(h) What is actual indicator diagram?

(i) Why carburetors are not used in CI engine?

(j) Draw a complete graph of stages of combustion is SI engine?

UNIT-I

Q2 (a) What is overall heat transfer coefficient? Determine overall coefficient for a boiler furnace composed of fire brick, insulating brick and steel plate and convection takes place on the inner side and outer side of the furnace. (6)

(b) In a heat exchanger, heat is transferred from water to air through a metal wall (k=54 W/mK). The rectangular fins 0.08 cm thick and 2.5cm long of the same material, spaced 1.25 cm apart is contemplated. Assuming water side convective heat transfer coefficient of 170W/m²K and air convective side heat transfer coefficient of 17 W/m²K, Compare the gain in the heat transfer rate achieved by adding fins to air side. Neglecting the temp. drop through the wall. Assume heat transfer from tip is negligible. (6.5)

Q3 (a) Assuming the sun to be a black body at a temperature of 5700°C. Calculate (6)

1. The emissive power of the surface of the sun.
2. Wavelength for maximum spectral intensity
3. Heat energy emitted by the sun per unit time assuming its diameter as 1.391 X10⁹m.

(b) What is Stefan-Boltzman Law? Explain the concept of total emissive power of a surface. (6.5)

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UNIT-II

Q4 (a) Explain boiling phenomenon and different regimes of pool boiling with the help of boiling curve. **(6)**

(b) Explain the concept of velocity boundary layers. Discuss the significance of these boundary layers in convective heat transfer mode. **(6.5)**

Q5 A fluid having specific heat of 3.2 kJ/kgK, flowing at the rate of 20000kg/H enters a counter flow heat exchanger at 120°C. The flow rate of water is 50000 Kg/h with an inlet temperature of 20°C. The heat transfer area is 10 m^2 and the overall heat transfer coefficient is 1050W/m^2K. Determine: **(12.5)**

1. The effectiveness of heat exchanger
2. The out temperature of fluid and water. (Specific heat for water 4.186kJ/kgK)

UNIT-III

Q6 (a) Discuss turbo charging in detail with neat sketch. **(6)**

(b) Describe the requirement of fuel injection system. Explain any one fuel injection system with diagram being used in IC engine? **(6.5)**

Q7 (a) What is ASTM distillation curve of the fuel? Discuss at least 4 effects of volatility on engine performance. **(6)**

(b) Explain the phenomenon of detonation in CI engine. What are the various factors which effects detonation in CI engine? **(6.5)**

UNIT-IV

Q8 (a) Define the following: **(6)**

1. Brake mean effective pressure,
2. Volumetric efficiency,
3. Specific fuel consumption.

(b) Discuss the various changes in design to improve the efficiency in modern vehicles. **(6.5)**

Q9 (a) Discuss the various methods used for measurement of brake power in IC engine? **(6)**

(b) A 4-S petrol engine delivers 35 KW with a mechanical efficiency of 0.80.the fuel consumption of the engine is 0.4kg/KW-hr and the air-fuel ratio is 14:1. The heating value of the fuel is 43000kj/kg. Find **(6.5)**

1. The indicated power;
2. The friction power;
3. Brake thermal efficiency.

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