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

M.Tech I Year I Semester Regular Examinations Jan 2020

THERMODYNAMICS AND COMBUSTION

(Thermal Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 What are the higher and the lower heating value of a fuel? How do they differ? How is the heating value of a fuel related to the enthalpy of combustion of that fuel. **12M**

OR

- 2 Steam at a pressure of 2000 kPa and 50°C is flowing in a pipe. An evacuated tank is connected to this pipe through a valve. The valve is opened and the tank is filled with steam until the pressure is 2000 kPa (line pressure), and then the valve is closed. The process takes place adiabatically and the kinetic energy and potential energy changes can be assumed negligible. Determine the temperature of the steam in the tank at the end of the filling operation. **12M**

UNIT-II

- 3 a What are the approximate chemical composition of gasoline, LPG, diesel, natural gas & methanol? How does presence of moisture in air affects the outcome of a combustion process. **6M**

- b A certain natural gas has following volumetric analysis: 65 percent CH₄, 8 percent H₂, 18 percent N₂, 3 percent O₂, and 6 percent CO₂. This gas is now burnt completely with the stoichiometric amount of dry air. What is the air-fuel ratio for this combustion process. **6M**

OR

- 4 a What are the causes of incomplete combustion and what the difference between complete and incomplete combustion? **6M**

- b Explain with neat sketch about pulverized fuel furnaces. **6M**

UNIT-III

- 5 a Derive an equation to measure the burning velocity of gaseous fuel. **6M**

- b Octane C₈H₁₈ is burnt with dry air. The volumetric analysis of the product on a dry basis is 9.21 percent CO₂, 0.61 percent CO, 7.06 percent O₂ and 83.12 percent N₂. Determine air-fuel ratio and the percentage of theoretical air used. **6M**

OR

- 6 a Octane C₈H₁₈ is burned with 250% theoretical air, which enters the combustion chamber at 25 degree C, assuming complete combustion and a total pressure of 1atm, determine air-fuel ratio and dew point temperature of the product. **6M**

- b 1gram sample of a certain fuel is burned in a bomb calorimeter that contains 2kg of water in the presence of 100gram of air in the reaction chamber. If the water temperature rises by 2.5 degree when equilibrium is established determine the heating value of the fuel in kj/kg. **6M**

UNIT-IV

- 7 a What are the factors affects the burner efficiency and give remedial action to overcome those effects. **8M**

- b List out types of burners and their function with neat sketch. **4M**

OR

- 8 a** Design an burner which uses gas as a fuel and the flow rate of oil is 20cc per minute. **6M**
b What is mean by atomizing burner. Explain its working with neat sketch. **6M**

UNIT-V

- 9 a** Discuss in detail about PV CELL energy system and their classification. **4M**
b Explain with required equations for nitrogen fuel cell working and its advantages. **8M**

OR

- 10 a** Differentiate between thermo-ionic and thermo-electric energy systems. **4M**
b Discuss in detail about contribution of direct energy conversion system in the field power sector with their advantage and disadvantages. **8M**

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