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

M.Tech I Year I Semester Regular Examinations July-2021

THERMODYNAMICS AND COMBUSTION

(Thermal Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 Derive an energy balance relation for a reacting closed system undergoing a quasi-equilibrium constant pressure expansion or compression process. L3 12M

OR

- 2 A fuel at 25 degree C is burned in a well insulated steady flow combustion chamber with air that is also at 25 degree C. under what condition will the adiabatic flame temperature of the combustion process be a maximum. L1 12M

UNIT-II

- 3 a One kmol of octane C_8H_{18} is burned with air that contains 20kmol of O_2 . assuming the product contains only CO_2, H_2O, O_2 and N_2 , determine the mol number of each gas in the products and the air-fuel ratio for this combustion process. L5 6M

- b How the presence of N_2 in air does affects the outcome of a combustion process. L1 6M
What does the dew point temperature of the product gases represent? How it is determined?

OR

- 4 a Propane C_3H_8 is burned with 75 percent excess air during a combustion process. Assuming complete combustion find air- fuel ratio. L1 6M

- b Octane C_8H_{18} 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 L1 6M

UNIT-III

- 5 A gases fuel with 80% CH_4 , 15 percent N_2 and 5 percent O_2 is burned with dry air that enters the combustion chamber at 25 degree and 100 kpa. The volumetric analysis of the product on a dry basis is 3.36% CO_2 , 0.09% CO , 14.91% O_2 , and 81.64% N_2 . determine the air-fuel ratio, percent theoretical air used, volume flow rate and air used to burn fuel at a rate of 1.4kg/min. L5 12M

OR

- 6 Derive an equation to measure the burning velocity of gaseous fuel. L3 12M

UNIT-IV

- 7 a How the flames are classified according to their structure explain in detail. L1 6M
b List out types of burners and their function with neat sketch L1 6M

OR

- 8 Explain with neat sketch of air aspiration gas burner. L2 12M

UNIT-V

- 9 a What is mean by direct energy conversion method and classify it according to their sources. L1 6M

- b Discuss in detail about PV CELL energy system and their classification. L1 6M

OR

- 10 Describe thermo-ionic energy system with neat sketch and list out the materials use in it. L2 12M

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