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B.TECH
(SEM V) THEORY EXAMINATION 2022-23
FUELS AND COMBUSTION

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2x10 = 20

(a) Define primary and secondary fuels.
(b) What is coal ranking?
(c) Explain cracking of crude oil.
(d) What do mean by Wobbe's index of gaseous fuel?
(e) Define stoichiometric air.
(f) What are limits of flammability?
(g) How combustion in a CI (diesel) engine is different from that in SI (petrol) engine?
(h) List the advantages of fluidized bed combustion.
(i) Define air pollution.
(j) Name the major pollutants released into the atmosphere from combustion of diesel in IC engines.

SECTION B

2. Attempt any *three* of the following: 10x3 = 30

(a) Differentiate between
  (i) Proximate and ultimate analysis of fuel.
  (ii) Solid, liquid and gaseous fuels.
(b) Explain the three main refinery processes involved in crude oil refining.
(c) Discuss the following:
  (i) Enthalpy of formation of products
  (ii) Adiabatic Flame Temperature
  (iii) Premixed and Diffusion flame
(d) What is a burner? Write the features of a good burner. Explain different types of gas burners.
(e) Explain the effects of air pollution on human health and environmental change.

SECTION C

3. Attempt any *one* part of the following: 10x1 = 10

(a) Calculate the GCV and NCV of the coal using the following compositions: (Use Dulong formula)
Carbon = 85%, Hydrogen = 8%, Sulphur = 1%, Nitrogen = 2%, Ash = 4%. Take latent heat of steam = 587 Cal/g
(b) What is coal preparation? Discuss its importance and different methods used for coal preparation.

4. Attempt any *one* part of the following: 10 x1 = 10

(a) Define atmospheric distillation.Explain the construction and working of atmospheric distillation unit (ADU) in a refinery with the help of neat sketch.

(b) What is gasification? Explain the working of a updraft gasifier with the help of well-labelled diagram.

5. Attempt any *one* part of the following: 10x1 = 10

(a) Calculate the minimum amount of air required for the complete combustion of 150 kgs of fuel containing 70 % Carbon, 15 % Hydrogen, 5 % Sulphur and the rest nitrogen by weight.

(b) Calculate the air-fuel ratio, % of carbon-dioxide by volume in the products and dew point of products when propane is burned with 20% excess air. Assume the pressure = 101.325 kPa and temperature = 25°C

6. Attempt any *one* part of the following: 10x1 = 10

(a) Discuss how will you determine the percentage of CO, CO_2 and O_2 in the flue gases? Draw the diagram of the apparatus.

(b) Explain the working of pulverized fuel firing system with the help of diagram. Write its advantages and disadvantages.

7. Attempt any *one* part of the following: 10x1 = 10

(a) Describe the various sources of air pollution. In your opinion, which one source is the biggest contributor towards air pollution?

(b) What are emission standards? Discuss the various ways to control emissions from vehicles.