B.Tech.(All Branches) / B.Tech. (Fire Engineering) First Semester (C.B.C.S.)

Energy and Environment

PSM/KW/23/2538

P. Pages : 3

Time : Three Hours

Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Diagrams and chemical equations should be given whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Write short note on **any two.** 4

i) Evaporation

ii) Condensation

iii) GCV and NCV

b) Define Renewable and Non Renewable energy sources with their examples. 4

c) Mention the various corrections applied during determination of calorific value of solid fuel by Bomb Calorimeter. 3

d) Using Dulong's formula, calculate GCV and NCV of a coal sample having ultimate analysis results: 3
C = 78%, H = 5%, N = 2%, S = 2% and ash = 11%, the latent heat of water is 587 cals/g.

OR

2. a) Write informative note on: 3
Significance of Ultimate Analysis of Coal.

b) Define sensible and Latent Heat. Explain it with suitable example. 3

c) Explain how the calorific value of a gaseous fuel is determined by using Boy's Calorimeter? 4

d) During the determination of calorific value of a coal sample by Bomb's Calorimeter following results were recorded: 4
Weight of fuel burnt = 1.85g
Weight of water taken in Calorimeter = 2200g
Water equivalent of Calorimeter = 490g
Initial Temp. of water = 25.8°C
Final temp. of water = 30.2°C

Acid Correction = 14 cals
Fuse wire correction = 6 cals
Thread correction = 5 cals
Cooling correction = 0.26°C

If fuel contains 7.5% of Hydrogen, calculate GCV and NCV of coal assuming latent heat of steam as 587 cals/g.

3. a) A solid fuel used in heating furnace has following compositions: C = 80%, H = 5%, O = 3.2%, N = 2%, S = 1% and remaining is ash. Calculate: 8
   i) Amount of minimum air required for complete combustion of 1 kg of fuel.
   ii) If 45% excess air is supplied find % composition of dry products of combustion.

   b) Explain how knocking occurs in petrol engine? How it is related to chemical structure of petrol? 4

   c) Write short note on: Power Alcohol. 2

OR

4. a) Explain Fractional Distillation of crude oil with a neat and labelled diagram. Mention the various fractions obtained during fractional distillation with their composition, boiling range and uses. 6

   b) What is Catalytic Cracking? Mention the important advantages of catalytic cracking over thermal cracking. 3

   c) How Biodiesel is synthesized by transesterification process? Explain its properties and applications. 3

   d) Give reason: Why good spark ignition fuels are poorer compression ignition fuels and vice versa. 2

5. a) Define Fuel Cell. State the working, advantages and disadvantages of Methanol fuel cell. 4

   b) How Hazardous waste is managed by Physical and Chemical Methods? 4

   c) State the utilization of syngas. 3

   d) Calculate the mass defect and binding energy per nucleon $^{59}_{27}Co$, given that the atomic mass of cobalt, Hydrogen atom and neutron are 58.95182 amu, 1.008142 amu and 1.008982 amu respectively. 3

OR

6. a) Explain the working of a Nuclear Power Reactor with a well labelled diagram. 4

   b) Define Photo Catalyst. State the applications and limitations of Photo Catalyst. 3

   c) Discuss the method of generating Biogas from Biomass. 4

   d) Write informative note on Landfill. 3

a) Explain in brief various pollutants released by Petroleum Industry. Mention the adverse effects pollution by Petroleum Industry. 6

b) Explain the environmental impact of the following **any two**.

i) Ammonia synthesis by Haber's Process.

ii) Cement Industry

iii) Sulphuric Acid Synthesis. 4

c) What are the major factors responsible for industrial waste production? Explain process waste and chemical waste.

OR

8. a) Mention the impact of Nitrogenous fertilizers on environment. Discuss the possible measures to prevent its impact. 4

b) Explain the various sources of pollution in Ammonia plant. Describe the basics of Green Ammonia Synthesis. 4

c) Describe the factors responsible for Industrial Pollution. 3

d) How Sulphuric Acid is synthesized by Contact Process? 3

9. a) What are Biodegradable Polymers? Give synthesis and applications of Polylactic Acid. 4

b) What are adhesives? Discuss the natural and synthetic adhesives. 3

c) Explain how Nanomaterials can be used for energy storage? 3

d) What are insulators? How are they classified? Give examples. 4

OR

10. a) What are conducting polymers? Give properties and applications of Polyaniline. 4

b) What are properties and applications of LCP? Discuss the different phases of LCP. 4

c) What are Nanostructured based solar cell? Illustrate its advantages and disadvantages. 3

d) What are composite materials? Explain any two industrial applications of composite materials. 3

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