Total No. of printed pages = 5

END SEMESTER EXAMINATION – 2022

Semester : 4th

Branch : Chemical Engineering

Subject Code : Ch-403

FUEL, FURNACE AND REFRACTORIES

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART – A are compulsory.
2. Answer any *five* questions from PART – B.

PART – A

Marks – 25

1. Choose the correct answer : 1×5=5

(a) Plutonium-239 is an example of

(i) By product fuel (ii) Fossil fuel

(iii) Nuclear fuel (iv) Chemical fuel

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(b) Characterization factor for naphthenic crude oil is

(i) equal to or less than 12

(ii) equal to or less than 10

(iii) greater than 12

(iv) greater than 5

(c) When crude contains more than 5 kg of salt per barrel of crude, it is

(i) sweet crude (ii) naphthenic crude

(iii) salty crude (iv) mixed crude

(d) Nitrogen content in coal is

(i) 2% (ii) 1-2.5%

(iii) 2-3.5% (iv) 1%

(e) LPG expands upto

(i) 432 times its volume

(ii) 542 times its volume

(iii) 147 times its volume

(iv) 247 times its volume

2. Fill in the blanks : 1×10=10

(a) Redwood viscometer-I is used for _____.

(b) Abels apparatus is _____ Cup.

(c) Values above 100 octane number are known as _____.

(d) Temperature range in catalytic cracking is _____.

(e) Most of the coking coals are essentially _____.

(f) Hydrogen _____ the calorific value of coal.

(g) Main constituents of producer gas are _____.

(h) Refractory should be able to _____ heat.

(i) Height of modern blast furnace is _____.

(j) Water or Steam carries the _____ energy to the earth's surface.

3. State True or False : 1×10=10

(a) Carbide theory indicates the presence of sulphur and nitrogen.

(b) Condenser is used to remove latent heat from hot gases.

(c) Fire point is lower than flash point

(d) Methane % in dry natural gas is more than wet natural gas.

(e) Reboiler maintains bottom pressure of the distillation column.

(f) Moisture reduces calorific value of coal.

(g) Carbon content in lignite coal is 90%.

(h) Furnace converts heat to chemical energy.

(i) Fire clay refractory is an example of basic refractory.

(j) Wind turbines convert the kinetic energy in the wind into mechanical power.

PART – B

Marks – 45

4. Write short notes on : 3×3=9

(i) Cetane number

(ii) Smoke point

(iii) Calorific value.

5. (a) What is pulverization of coal and what are its advantages ? 4

(b) Write short notes on bituminous and anthracite coal. 5

6. Describe the single stage atmospheric distillation unit with a suitable diagram. 9

7. (a) What is solar energy ? Give its examples. 3

(b) What do you mean by Wet and Dry natural gases ? 3

(c) What are the advantages of CNG over Petrol ? 3

8. (a) Explain the manufacturing process of water gas with diagram. 6

(b) What are the properties of a good refractory ? 3

9. (a) Explain the manufacturing process of fire clay refractory along with its use. 5

(b) Write a short note on nuclear energy. 4

10. Describe the construction,working and uses of blast furnace with diagram. 9