Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CHE-OLD)/SEM-4/CHE-404/2012

2012

ENERGY SOURCES AND THEIR UTILIZATION

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Fermented Bagasse have ..... calorific value compard to air-dried bagasse.

a) same

b) higher

c) very low

d) low.

ii) The strata of peat under the eath's crust found generally

a) below the strata of lignite coal

b) below the strata of anthracite coal

c) above the strata of lignite coal

d) between the strata of lignite coal and bituminous coal.

iii) The octane number of aviation gasoline may be

a) 10 b) 50

c) 100 d) 75.

iv) Which of the following fuels has the highest calorific value per unit mass ?

a) Coal b) Kerosene

c) Natural gas d) Furnace oil.

v) Kerosene should have

a) low smoke point

b) high smoke point

c) high aromatics content

d) low paraffins content.

vi) High paraffinic Pennsylvania oil has a VI of ..... and a napthenic Golf coast oil has a VI of ..... .

a) 0, 100 b) 0, 0

c) 100, 100 d) 100, 0.

vii) The solar cells convert the sunlight directly into ..... energy.

a) thermal b) electrical

c) mechanical d) chemical.

viii) Bio-gas production is a ..... decomposition of organic wastes.

a) aerobic b) anaerobic

c) both (a) and (b) d) none of these.

ix) Heliostat is a

a) solar collector b) solar converter

c) large reflecting mirror d) none of these.

x) Calorific Value (kcal/Nm^3) of gaseous fuels

a) decrease with increase in molecular weight

b) increase with increase in molecular weight

c) remains constant with change in molecular weight

d) is always negative.

xi) Water gas is also known as blue water gas or blue gas because it gives a blue flame owing to high ..... content.

a) oxygen b) carbon monoxide

c) hydrogen d) carbon dioxide.

xii) Wind energy is

a) constant source of energy

b) intermittent source of energy

c) not a renewable energy

d) no backup power is needed.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Write shorts notes on any *two* of the following : $2 \times 2\frac{1}{2}$

a) Lignite Coal & Bituminous Coal

b) Azeotropic distillation

c) Viscosity Index.

3. a) What is spontaneous inflammation or self ignition of coal ?

b) What is coking of coal ? Which types of coal have this property ? 2 + 2 + 1

4. Briefly discuss the Catalytic cracking of Cude oil.

5. Write short notes on any *two* of the following : $2 \times 2\frac{1}{2}$

   a) Octane number & Cetane number

   b) Pour point & Cloud point

   c) Smoke point & Char value.

6. What is geothermal energy ? Describe the anaerobic digestion process ?

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Define gross calorific and net calorific values. What is the basic difference between these two ? 5

   b) The following data are available for a coal of Raniganj coalfield :

Proximate analysis, % air-dried			
Moisture	Ash	Volatile matter	Fixed Carbon
1·3	16·0	30·1	52·6

Ultimate analysis, % d.m.m.f.				
Carbon	Hydrogen	Sulphur	Nitrogen	Oxygen
86·52	5·27	0·64	2·37	5·20

For Goutal's formulae, a = constant depending upon the value of volatile matter.

V.M., % d.a.f.	5	10	15	20	25	30	35	38	40
a	145	130	117	109	103	98	94	85	80

Given experimental gross calorific value,

kcal/kg air-dried : 6890

Calculate its gross calorific value using empirical formulae and compare the values with the experimental. 10

8. a) Define HTC and LTC. 5

b) What is beehive coke oven ? Describe its working principle. 6

c) Write short notes on any *two* of the following : 2 + 2

i) Angle of repose

ii) Grindability of coal

iii) Solubility of coal.

9. a) Write shorts notes on classification of Petroleum. 5

b) Discuss on Petroleum Distillation with diagram. 10

10. Describe Fisher-Tropsch process & Bergius-Pier process.

$2 \times 7\frac{1}{2}$

11, a) Describe the carbureted water gas process with a flow diagram. 10

b) Write short notes on coal bed methane. 5

12, a) What is biogas ? Explain briefly the anaerobic digestion process in the production of biogas. 5

b) What is gobar gas ? 2

c) Describe the production of gobar gas with figure and state the advantages and disadvantages of gobar gas production technology. 8