

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
compared to air-dried bagasse.

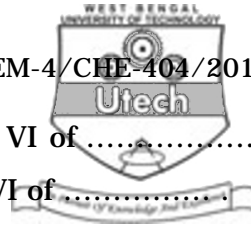
- a) same
- b) higher
- c) very low
- d) low.

4207 (O)

[Turn over



- ii) The strata of peat under the earth'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.

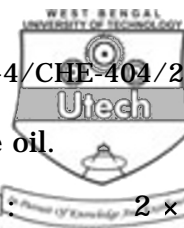


- vi) High paraffinic Pennsylvania oil has a VI of
and a naphthenic Gulf coast oil has a VI of
- a) 0, 100 b) 0, 0
c) 100, 100 d) 100, 0.
- vii) The solar cells convert the sunlight directly into
energy.
- a) thermal b) electrical
c) mechanical d) chemical.
- viii) Bio-gas production is a decomposition 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/Nm³) 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.

- ## GROUP – B

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

- 4207 (O)**



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

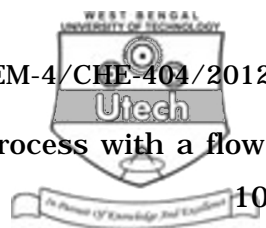
Given experimental gross calorific value,

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 short 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
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