ENERGY SOURCES AND THEIR UTILIZATION (SEMESTER - 4)

CS/B.TECH (CHE-N)/SEM-4/CHE-404/09

1. ..... *Signature of Invigilator*

2. ..... *Signature of the Officer-in-Charge*

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (CHE-N)/SEM-4/CHE-404/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENERGY SOURCES AND THEIR UTILIZATION (SEMESTER - 4)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

.....

Head-Examiner/Co-Ordinator/Scrutineer

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GROUP – A

(Multiple Choice Type Questions)

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

i) The cooking temperature in furnace type delayed cooking process is

a) 700°C b) 500°C

c) 600°C d) 1000°C. ☐

ii) No by-product recovery can be achieved in

a) Waste Heat Ovens b) Regenerative Ovens

c) Beehive Ovens d) all of these. ☐

iii) Brown coal is the other name of

a) Bituminous coal b) Peat

c) Lignite d) Anthracite coal. ☐

iv) Low temperature carbonization is carried out at a temperature of

a) 600°C b) 700°C

c) 500°C d) 1100°C. ☐

v) The chief constituent of CBM is

a) hydrogen b) nitrogen

c) carbon dioxide d) methane. ☐

vi) Density of paraffinic crudes is ..... asphaltic crudes.

a) higher than b) lower than

c) same as d) half of.

vii) The octane number of a gasoline can be increased by

a) thermal cracking b) coking process

c) reforming d) visbreaking.

viii) Bomb calorimeter is used for the determination of calorific value of the ..... fuels.

a) solid b) liquid

c) gaseous d) both solid and liquid.

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

a) thermal b) electrical

c) mechanical d) chemical.

x) Bio-gas production is an ..... decomposition of organic wastes.

a) aerobic b) anaerobic

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

xi) Limitation of gobar gas is that

a) it consists of poisonous gas

b) it should be used within 10 metres of the gobar gas plant

c) it contains smoke, dust, dirt etc. and makes environment polluted

d) all of these.

xii) Heliostat is a

a) solar collector b) solar converter

c) large reflecting mirror d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions. 3 × 5 = 15

2. What is caking ? Why is it necessary to measure ? Which type of coal has these properties ? 5

3. What are the advantages of catalytic cracking over thermal cracking. 5

4. What is self ignition of coal ? Explain the term 'weathering of coal'. 2 + 3

5. What are nuclear fission and nuclear fusion ? In terms of multiplication factor (k) how is the chain reaction controlled in a nuclear reactor ? 5

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

   a) Solar pond

   b) Cloud point

   c) Aviation fuel

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. a) Explain Waste Heat Coke process for the production of metallurgical coke with a neat flow sheet. 7

   b) Write down at least three basic differences between High Temperature Carbonization process and Low Temperature Carbonization process. 3

   c) The coal obtained from Raniganj coal field gave the following proximate analysis :

   Moisture-1·6%, Ash-15·7%, Volatile matter-27·8% and Fixed Carbon-54·9%. Calculate its ash on a dry basis and volatile matter on d.a.f. (dry ash free) and d.m.m.f. (dry and mineral matter free) bases. 5

8. a) How can you reduce the viscosity and pour point of a heavy fuel oil without coke formation ? Briefly elaborate the process with a flow sheet. 7

b) What do you mean by octane number of a gasoline and how can it be determined ? 4

c) Describe Bergius process for the extraction of crude oil from coal dust. 4

9. a) What are the different types of catalytic cracking processes ? Explain Houndry's fixed bed catalytic cracking process with a neat flow sheet. 7

b) Write down the procedure for the proper storage of coal. 3

c) What do you mean by weathering of coal and why is it important ? 3

d) "All coking coals are necessarily caking." Justify the statement. 2

10. a) Mention the characteristics of a good fuel. 4

b) What is gross calorific value ? How does it differ from net calorific value ? 4

c) What is Wobb's Index ? 2

d) Calculate the Wobb's index of natural gas comprising of 89% CH_4 , 8% C_2H_6 , 2% C_3H_8 and 1% C_4H_{10} by volume. The calorific values (k.cal/N-m^3) of the constituents are as given below :

CH_4 = 9500, C_2H_6 = 16644, C_3H_8 = 23688, C_4H_{10} = 30714. 5

11. a) Write a note on utilization of geothermal energy. 8

b) Explain the operating principles of different types of wind eneregy mills. 7

END