Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CHE-NEW)/SEM-3/ES-302/2011-12

2011
ENERGY TECHNOLOGY

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 the following : $10 \times 1 = 10$

   i) If porosity of the coke increases then ..... decreases.
   - a) reactivity
   - b) surface area
   - c) mechanical strength
   - d) softness.

   ii) Ammonia yield is more in
   - a) Low Temperature Carbonization
   - b) High Temperature Carbonization
   - c) Both Low temperature Carbonization and High temperature Carbonization
   - d) none of these.

   iii) Heavy water is used as ..... in a nuclear reactor.
   - a) Fuel
   - b) Moderator
   - c) Radiation shield
   - d) none of these.

   iv) Flat plate collector absorbs
   - a) Only beam radiation
   - b) only diffused radiation
   - c) Both beam and diffused radiation
   - d) none of these.

v) ..... type of solar collectors has the maximum concentrating capacity.

a) Parabolic dish collector

b) Cylindrical parabolic concentrator

c) Compound parabolic concentrator

d) Flat plate collector.

vi) Which of the following has the maximum calorific value ?

a) CO b) CO_2

c) C_2H_2 d) CO & CO_2.

vii) C/H ratio is minimum for

a) Furnace oil b) Coal

c) Natural gas d) Naptha

viii) Which of the following coals has the highest Calorific value ?

a) Peat b) Lignite

c) Bituminous d) anthracite.

ix) ..... coal burns with a yellow Smokey flame.

a) Lignite b) Anthracite

c) Peat d) Bituminous.

x) Which of the following is a non-conventional, non-renewable Energy Source ?

a) Solar energy b) Geothermal energy

c) Nuclear energy d) Wind energy.

GROUP – B

Answer any five questions, taking at least one from each module.

5 × 12 = 60

Module 1

2. a) Describe and explain the float and sink test. What is ngm ?

   b) Justify the statement "Coal does not contain ash, but it yields ash. "

   c) Briefly discuss the composition and properties of bituminous coal. 5 + 3 + 4

3. a) An Indian coal has the following proximate analysis on air-dried basis :

   Moisture : 1.6%, Ash : 15.7%, Volatile matter : 27.8%, Fixed carbon : 54.9% Calculate its ash on dry basis and volatile matter on d.a.f. and d.m.m.f bases.

   b) Explain the d.a.f. and d.m.m.f. bases of reporting analysis results for coal. Which basis should be used for analyzing pure coal in India ?

   c) What is spontaneous ignition of coal ? How does it occur ? What preventive measures should be taken to avoid it ? 5 + 3 + 4

Module 2

4. Describe the catalytic reforming process mentioning the following points :

   a) Catalyst used

   b) Reactions involved

   c) Process variables

   d) Complete flow-sheet of the process. 12

5. Describe the fluidized catalytic cracking process mentioning the following points :

   a) Feedstock used

   b) Catalyst used

   c) Process variables

   d) Brief process description

   e) Flow-sheet of process. 12

Module -3

6. a) Enumerate the different types of gaseous fuels. What are rich and lean gases ? Give examples.

   b) Describe the Lurgi process of gasification of coal, giving the diagram of the gasification unit and the reactions.

   5 + 7

7. Describe the water-gas manufacturing process with a suitable flow-sheet and reactions. What are the important uses of water-gas ? 12

Module-4

8. a) Describe the working principle of flat plate solar collector with diagram.

   b) What are heliostats ?

   c) What is central receiver system ?

   d) What is the role of heliostats in central receiver system ? Differentiate between heliostat and photovoltaic cells in harnessing solar energy. 5 + 1 + 2 + 4

9. a) Give a brief idea about geothermal energy and how it can be used to produce electricity.

   b) What is a fast breeder reactor ?

   c) Describe the working of a nuclear reactor in brief.

   5 + 2 + 5