

**ENERGY ENGINEERING  
(CHEN 2103)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group - A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Crude benzol is  
(a) light oil (b) heavy oil  
(c) viscous oil (d) both (b) and (c)
- (ii) 1,4-D-Glucopyranose is a part of  
(a) coal (b) biomass  
(c) cellulose (d) hemicellulose
- (iii) Berrisford separator is used for coal  
(a) cutting (b) screening  
(c) washing (d) separation
- (iv) Thorium is derived from  
(a) bismath (b) cobalt molybdenum  
(c) monazite sand (d) river sand
- (v) The principal component of coke oven gas is  
(a) methane (b) carbon monoxide  
(c) hydrogen (d) nitrogen
- (vi) A renewable source of energy is  
(a) coal (b) petroleum  
(c) solar energy (d) coal bed methane
- (vii) Cetane number is a measure of anti-knocking property of  
(a) gasoline (b) diesel oil  
(c) kerosene (d) fuel oil

- (viii) Blue gas is nothing but  
(a) producer gas (b) blast furnace gas  
(c) water gas (d) hydrogen
- (ix) Bomb calorimeter is used for the determination of calorific value of the  
(a) gaseous fuel (b) solid fuel  
(c) liquid fuel (d) both solid and liquid fuels
- (x) Which of the following type of collectors is used for low temperature systems?  
(a) flat plate collector (b) line focussing parabolic collector  
(c) paraboloid dish collector (d) all of the above

### **Group - B**

2. (a) Describe how coal is cleaned by the froth flotation technique.  
(b) Explain how biomass is thermo-chemically converted into biofuel.  
(c) Write down the merits and demerits of coke oven.  
**4 + 4 + 4 = 12**
3. (a) Briefly describe the proximate and ultimate analyses method of coal. Write a brief note on energy scenario in India.  
(b) Write down the features of LTC and HTC.  
**(6 + 2) + 4 = 12**

### **Group - C**

4. (a) Explain the role of desalter unit in the petroleum refinery.  
(b) Write short notes on hydro treating and catalytic reforming.  
(c) Explain the role of soaker drum in a delayed coking unit. What are the advantages of fluidized bed catalytic cracking over fixed bed catalytic cracking?  
**3 + (2 + 2) + (3 + 2) = 12**
5. (a) What is drilling rig? Explain the vertical drilling, horizontal drilling and multilateral drilling methods for the crude oil extraction.  
(b) Explain the visbreaking and coking operation in a refinery.  
**(1 + 2 + 2 + 2) + (2 + 3) = 12**

### **Group - D**

6. (a) What is water gas and how does it differ from carbureted water gas?  
(b) What is producer gas? Describe briefly how producer gas is manufactured.

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(c) How do you classify the gaseous fuels? What is coke oven gas?  
**(2 + 3) + 3 + (3 + 1) = 12**

7. (a) Describe production of methane using anaerobic digestion of wastes with flowsheet.

(b) Describe the different factors affecting the anaerobic digestion under standard conditions.

**7 + 5 = 12**

**Group - E**

8. (a) What do you mean by stand alone and building integrated system for supply of power using photovoltaic cell?

(b) What is the basic principle of photovoltaic cell?

**6 + 6 = 12**

9. (a) How does a fuel cell differ from batteries?

(b) What are the benefits of fuel cells?

(c) Explain the working of solar water heater with schematic diagram.

**4 + 3 + 5 = 12**

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