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### CS/B.Tech/CHE(N)/SEM-3/ES-302/2012-13 2012

### **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 any ten of the following :  $10 \times 1 = 10$ 
  - i) Washing of coal is done to
    - a) remove the inherent impurities
    - b) remove the adhering impurities
    - c) reduce the ash content
    - d) both (a) and (c).
  - ii) Caking index of coal is a measure of its
    - a) abradability
    - b) reactivity
    - c) agglutinating (binding) propeties
    - d) porosity.

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iii)	Sola	ar cells convert sunligh	t dire	ectly into	
	energy.				
	a)	Thermal	b)	Electrical	
	c)	Mechanical	d)	Chemical.	
iv)	Anti-knocking charcteristic of gasoline is indicated by				
	a)	Diesel index	b)	Cetane number	
	c)	Octane number	d)	Flash point.	
v)	Aniline point is highest for				
	a)	Iso-paraffins	b)	Aromatics	
	c)	Olefines	d)	<i>n</i> -paraffins.	
vi)	Odu	ıring agent in LPG is			
	a)	Methane	b)	Propane	
	c)	Ethyl mercaptan	d)	All of these.	
vii)	Catalyst used in catalytic reforming is				
	a)	Platinum	b)	TiO <sub>2</sub>	
	c)	Silica-alumina	d)	Iron.	
viii)	Bio-gas production is an decomposition of				
	organic wastes.				
	a)	aerobic	b)	anaerobic	
	c)	both (a) and (b)	d)	none of these.	
ix)	Blue	e gas is nothing but			
	a)	Producer gas	b)	Blast furnace gas	
	c)	Water gas	d)	Hydrogen.	

- x) LPG contain
  - a) propane and pentane b) butane and propane
  - c) butane and methane d) none of these.
- xi) Control rods ar used in nuclear reactor to
  - a) protect the moderator
  - b) control the pressure vessel
  - c) slow down the fast fission neutron
  - d) absorb extra neutron in the reactor.
- xii) Which of the following is a moderating material used in nuclear reactor?
  - a) Graphite
  - b) Cadmium
  - c) Zircalloy (an alloy of zirconium and aluminium)
  - d) stainless steel.

#### **GROUP - B**

### (Short Answer Type Questions)

Answer any *three* of the following.

- 2. Explain with the help of a flowsheet how you can utilize the waste heat during the production of coke from coke oven process.
- 3. "Coke produced by low temperature carbonization of coal are more reactive". Justify the statement.
- 4. What are the advantages of fluidized bed catalytic cracking process over fixed bed catalytic craking process?
- 5. Why is reforming done in petroleum refinery? Discuss various reforming reactions with the help of chemical formula.
- 6. What do you mean by stand alone and building integrated system for the use of photovoltaic cell?

 $3 \times 5 = 15$ 

# GROUP - C ( Long Answer Type Questions )

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

- 7. a) An Indian washery uses a coal of 21.0% ash content. If the clean product has an ash content of 18.7%, the sinks have an ash content of 41.2% and theoretical recovery is 91.6%, compute the performance of the washery.
  - b) What is the working principle of Baum jig washer?
  - c) What is by-product of slot type coke oven ? How recovery of by-product from coke oven gas is being performed ? 3+6+6
- 8. a) Briefly describe the classification & composition of Petroleum.
  - b) Discuss the steps of crude oil distillation along with a process flow sheet and also the common fractions from crude petroleum with their boiling point range. 5 + 10
- 9. Discuss the steps of crude oil distillation along with a process flow sheet.
- 10. a) Define the following properties of petroleum oils :
  - i) Pour point
- ii) Octane number
- iii) Aniline point
- iv) Aviation fuel power number
- v) Cloud point.
- b) Narrate briefly the method used for the production of olefines from Naphtha.
- c) Draw the Fischer-Tropsch process flow chart for producing liquid fuel from coal. 5+5+5
- 11. What are the several characteristic features of a solar collector? Why transparent covers are used in a flat collector? Describe the working principle of a solar pond. What are the resources for geothermal energy?

4 + 2 + 6 + 3

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