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## CS/B.TECH /BT/SEM-7/BT-703B/2012-13

## 2012

### RENEWABLE 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 )

Choose the correct alternatives for any *ten* of the following:

						10 ×	1 =	10
i)	Which	of th	e following	crops	produces	highest y	rield	of
	ethano	1?						

- a) Sugarcane b)
- b) Cassava

c) Maize

1.

- d) Sweet sorghum.
- ii) Octane number of CNG is
  - a) 60 -70

- b) 70 80
- c) 80 90
- d) above 90.
- iii) The wind speed at which wind turbine starts to operate is called
  - a) cut-in speed
- b) cut-out speed
- c) rated wind speed
- d) normal speed.
- iv) Which of the following semiconductor materials are mainly used in solar cells?
  - a) Pb

b) Au

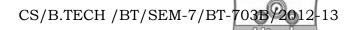
c) Cd

d) Si.

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v)	The	maximum	theoretical	effic	ciency	of wind energy		
	conv	version system	n is		1	As Abanque (1/ Exercisión 200/ Explicad)		
	a)	0.2		b)	0.4	- Standy late		
	c)	0.5		d)	0.6.			
vi)	In ra	adioactive dec	cay the ulti	mate	e product is			
	a)	Sn		b)	Si			
	c)	Pb		d)	Al.			
vii)	Com	ipound parab	oolic solar c	ollec	llector			
a) is of non-concentrating type								
	b)	b) is of concentrating type						
	c)	has transpa	rent cover					
	d)	can achieve	low temper	atur	e.			
viii)	iii) In hydrothermal systems, when steam, water and dissolved solids are available as source of energy, the							
						ce of energy, the		
	entrained solids are removed by							
	a)	filters		b)	centri	fugal separators		
	c)	strainers		d)		of these.		
ix)	The	_	_			is defined as		
a) product of heat flux and thermal conduct				ŭ				
	b)	ratio of heat				·		
	c)	ratio of ther		-				
	d)	-	_	of 1	neat fl	lux and thermal		
		conductivity						
x) Gasohol is a mixture of								
	a)	90% ethano	_	_				
	b) 75% ethanol and 25% gasoline							
c) 50% ethanol and 50% gasoline								
	d) 10% ethanol and 90% gasoline.							
xi) Biodiesel production is catalysed by								
	a)	amylase		b)	protea			
,		lipase	1		xylana			
xii)	,				in tree does not			
	depend on							
	a)	tree age		b)	tree s	pecies		
	c)	tree size		d)	size o	f tree's leaf.		



#### **GROUP - B**

#### (Short Answer Type Questions)

Answer any three of the following

 $3 \times 5 = 15$ 

- 2. Mention one photosynthetic hydrogen producing strain. Show the hydrogen production cycle in presence of hydrogenase and mediator. What are the advantages of hydrogen as fuel. 1 + 2 + 2
- 3. Do you believe Bio-diesel and bioethanol are next generation renewable green fuel? Explain.
- 4. Does municipal solid waste to be considered as biomass? Explain.
- 5. What are the advantages of rice husk used in rice husk gasifier? Draw a schematic of rice husk gasifier. 2 + 3
- 6. How are photobioreactors (PBR) used in algae cultivation?

#### **GROUP - C**

#### (Long Answer Type Questions)

Answer any three of the following.

 $3 \times 15 = 45$ 

- 7. a) What is solar collector?
  - b) Describe the working principles of Flat plate type collector, compound parabolic collector and evacuated type collector with diagram.
  - c) How does the solar water heating system work?

2 + 9 + 4

- 8. a) What is biodiesel? State the advantages of using biodiesel.
  - b) Write down the steps involved for the production of biodiesel.
  - c) What do you mean by Microbial Enhanced Oil Recovery (MEOR) process? Describe briefly the advantages and disadvantages of MEOR. 5 + 5 + (2 + 3)

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- 9. a) For a wind turbine system prove that  $V_b = \frac{v v_d}{2}$ , where  $V_b$  is velocity of wind at blades,  $V_u$  is velocity of upstream wind and  $V_d$  is velocity of downstream wind.
  - b) Wind at 1 standard atmospheric pressure and 15°C has a speed of 10 m/sec. A 10 m diameter wind turbine is operating at 5 rpm with maximum efficiency 40%. Calculate (i) the total power density in wind stream, (ii) the maximum power density, (iii) the actual power density and (iv) the power output of the turbine. Given air density = 1·226 kg/m<sup>3</sup>.

    5 + (4 × 2½)
- 10. Write short notes on any *three* of the following:  $3 \times 5$ 
  - a) Transerterification
  - b) Gravitational energy
  - c) Solar photovoltaic cell
  - d) Pyrolysis
  - e) Energy capital and energy income.
- 11. a) Draw a schematic of Gobor gas plant and explain the biochemical process.
  - b) Estimate the volume of family biogas digester and the power available from the digester, suitable for output of 10 cows with a retention time of 20 days at the ambient temperature of 30°C. Assume the following:
    - (i) Dry matter consume per day = 1 kg, (ii) Biogas yield = 0.24 m<sup>3</sup>/kg, (iii) Efficiency of burner = 60%, (iv) Production of methane in biogas = 80%, (v) Heat of combustion of methane = 28 MJ/m<sup>3</sup>, (vi) Density of cow dung = 50 kg/m<sup>3</sup>. 5 + 10

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