



Name : .....  
Roll No. : .....  
Invigilator's Signature : .....

**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 )**

1. Choose the correct alternatives for any *ten* of the following :  
10 × 1 = 10
- i) Which of the following crops produces highest yield of ethanol ?
    - a) Sugarcane
    - b) Cassava
    - c) Maize
    - 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.





**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following  $3 \times 5 = 15$

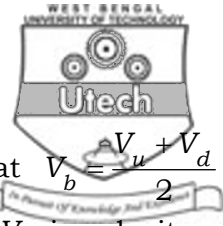
2. Mention one photosynthetic hydrogen producing strain. Show the hydrogen production cycle in presence of hydrogenase and mediator. What are the advantages of hydrogen as fuel.  $1 + 2 + 2$
3. Do you believe Bio-diesel and bioethanol are next generation renewable green fuel ? Explain.
4. Does municipal 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.  $5 + 5 + ( 2 + 3 )$



9. a) For a wind turbine system prove that  $V_b = \frac{V_u + V_d}{2}$ , 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 × 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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