Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.TECH (ICE-N) / EIE (O) / SEM-8 / EE-802g / 2011

2011

NON-CONVENTIONAL ENERGY SOURCES

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) The energy payback period of a single crystal silicon cell is

a) 6 months to 1 year b) 1 to 2 years

c) 10 to 20 years d) 3 to 5 years.

ii) Extra terrestrial insulation is

a) 1000 w/m^2 b) 1353 w/m^2

c) 100 w/m^2 d) 1453 w/m^2.

iii) The efficiency of a commercial solar cell lies in the range

a) 0% -10 % b) 10% -20 %

c) 20% -30 % d) 50% -60 %.

iv) A two-blade wind turbine produces maximum power when the tip-speed ratio is equal to

a) Π b) 2Π

c) 3Π d) 0·593.

v) Ocean wave energy can be effectively stored as

a) Hydrogen energy b) Electrical energy

c) Thermal energy d) Mechanical energy.

vi) IREDA was established in

a) 1987 b) 1982

c) 1989 d) 1992.

vii) The production of biogas through anaerobic digestion depends on slurry

a) temperature

b) both temperature and pH value

c) pH value

d) pressure.

viii) The most expensive component of PV system is

a) storage device b) control circuit

c) solar cell d) MPPT.

ix) The variation of cell voltage with insolation is

a) linear b) constant

c) exponential d) logarithmic.

x) A full tidal cycle is of the duration of

a) 6 hrs b) 12 hrs

c) 12 hrs 25·2 minutes d) 24 hrs.

xi) The percentage of world's energy comes from fossil fuels is

a) 80% b) 75%

c) 78% d) 87%.

GROUP – B

(Short Answer Type Questions)

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

2. Why is coal not considered as biomass energy source though it is originated from biomass ?
3. Explain electricity generation from Municipal Solid Waste (MSW).
4. What is understood by geothermal energy ? What are geothermal fields ? 1 + 4
5. Define the following parameters used in rotor design :
   a) pitch angle
   b) solidity
   c) tip speed ratio.
6. Prove that Bct_3 limit is 59·3%.

GROUP – C

(Long Answer Type Questions)

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

7. a) How are the tidal power plants classified based on their operation ?
   b) Explain with sketches the arrangement and operation of different types of tidal power plants. 3 + 12
8. a) Describe the fabrication process of silicon single crystal solar cell starting from SiO_2.
   b) Draw a sketch & label the following parts : encapsulation, anti-reflecting coating current collecting figures-*n* junction with depletion layer & the bottom electrode.

c) Why series-parallel connection of solar cells are made & diodes put in the series link in a given direction ? Explain. 5 + 5 + 5

9. a) What are the major steps involved in the biomethanation of organic residues.

b) With probable chemical equations describe gasification of solid biomass in an up-draft gasifier.

c) What are the different process parameters which affect the rate of biogas production inside a biogas digester ?

5 + 7 + 3

10. a) Why a number of manipulations with wind data are required ?

b) State and explain the different methods of wind data processing for estimating the energy output of a given wind machine. 3 + 12

11. Write short notes on any *three* of the following : 3 × 5

a) Down-Draft Gasifier

b) Vapour dominated geothermal system

c) Site selection of wind power station

d) Shadowing effect on solar cell

e) Wind electric generator.

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