

Total No. of Questions : 7]

SEAT No. :

P3237

[Total No. of Pages : 3

[4859] - 1030

B.E. (Electrical Engineering) (End Semester)

RENEWABLE ENERGY SYSTEM

(2012 Pattern) (Elective - I)

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Total Four Questions. Q1 is compulsory. Solve any one question from Q.2 and Q.3, Q.4 and Q.5; and Q.6 and Q.7.*
- 2) *Assume suitable data if necessary and as applicable.*
- 3) *Draw neat sketches wherever required.*

- Q1)** a) Describe the instrument used for measurement of solar global radiation. [5]
- b) List the different silicon technologies available for solar PV cell. Explain any one in detail. [5]
- c) What is Tip Speed Ratio (TSR)? Find TSR if the rotor speed is 214 rpm and wind velocity is 8 m/sec. and rotor diameter is $d = 4.2838$ m? What are the effects of more or less TSR on generation? [5]
- d) With the help of illustrative example, list the steps involve in designing Residential solar PV system. Assume the size of the home is 2 rooms consist of each dc electric load of one light (24W) and one fan (36 W) only. [5]
- Q2)** a) What are the Biomass Resources'? Explain with the help of block diagram a biomass based power generation. [8]
- b) An I. C. engine gives total output energy of 1000 kWh. Biogas from a Biogas plant is used as a fuel for I. C. Engine. The engine efficiency is 90% and biogas plant efficiency is 70%. Energy density of biogas is 250 kWh / Nm³. Cow dung is used as input energy source for biogas plant. Specific energy & density of Cow dung is 0.074 kWh/kg & 1500 kg/m³ respectively. Determine. [8]

P.T.O.

- i) Total volume of Biogas required in Nm³ (Normal cubic meter) as input to I. C. Engine?
- ii) Weight in kg & volume in m³ of biomass used?

OR

- Q3)** a) Explain fluidized bed type biomass gasifier in detail with neat diagram? [8]
- b) The following data is given for a biogas digester suitable for the output of five cows: Retention time = 30 days, temperature = 30°C, dry matter consumed per day = 4 kg, biogas yield = 0.28 m³/kg, Burning η = 60%, methane proportion = 0.8, heat of combustion of methane = 28 MJ/m³, density of dry material = 50 kg/m³. [8]

Find :

- i) Volume of biogas digester
- ii) Volume of biogas
- iii) Power available from digester

- Q4)** a) List the methods of Hydrogen storage? Explain any two? [8]
- b) A 12 V battery bank rated at 150 Ah under standard conditions need to deliver 600 Wh over a 12 h period every day. Calculate number of day's battery would able to supply, if depth of discharge (DOD) is [8]
- i) 100% at -10°C and
 - ii) 50% at -25°C

OR

- Q5)** a) Name different energy storage systems? Explain any two energy storage systems? [8]
- b) A 100 Ah, 12 V battery with a rest voltage of 12.5 V is charged (at its current State of Charge) at a C/4 rate (a charge rate in amps of one-fourth the overall battery capacity in amp hours), during which time the applied voltage to the battery is 13.0 V. [8]
- i) Estimate the internal resistance of the battery?
 - ii) Estimate the power and energy lost during charging?

- Q6)** a) Explain with the help of block diagram grid connected PV system. [8]
- b) A 1.2 V AAA battery costs Rs 20 each. It is rated for 60 mA at 16 Hrs. It is required to supply 1kWh of energy using this option. Determine its cost in Rs per kWh? If annual saving of Rs 5000/- is observed due to this, in how many years investment cost will be returned? [10]

OR

- Q7)** A person wants to purchase solar water heating system of Rs 20000/- It is require to do a down payment of Rs 4000/-. An annual end of year payment of Rs 2400/- is required for 10 years. However, the person elects to pay Rs 2200/- yearly and a balance payment at the end. Determine the value of balance payment if money is worth 10% interest. [18]

