B.E. SEM VIII / CBGS / MECH / MAY 2017 | 30-05-17

Q.P. Code:18412

(3 Hours) [Total Marks: 80]

N.B.: (1) Question No. 1 is compulsory.

(2) Answer any three from the remaining five questions.

(3) Assume suitable data if required.

(4) Figures to the right indicate full marks.

1. Write short notes on any four of the following. [20]
   a) Fuel cells.
   b) Classification of energy sources.
   c) Life cycle cost.
   d) Solar still.
   e) HAWT.

2. a) Data for FPC used for heating are given below:
   Location and latitude Coimbatore: ($11^0 00'N$)
   Day and Time: March 22, 14.30-15.30 LST
   Annual average intensity of solar radiation: 560 W/m^2
   Collector tilt= 26^0.
   No. of glass covers = 2
   Heat removal factor of collector = 0.82
   Transmittance of glass=0.88
   Absorptance of glass = 0.93
   Top loss coefficient= 7.95 $W/m^2\ ^0C$
   Collector fluid temperature =75^0C
   Ambient temperature=25^0C
   Diffusive reflectance for two covers: 0.24.
   Calculate 1) solar altitude angle, 2) incident angle and collector efficiency. [10]
   b) Draw a neat diagram and explain working of KVIC design of a biogas digester. [10]

3. a) Estimate monthly average total daily radiation on FPC facing south, at Delhi ($28^0 35'N, 77^0 12'E$) during the month of November if the average sunshine hours per day is 9.5. Assume the values of a=0.31 and b=0.43. [10]
   b) Calculate i)the volume of biogas digester suitable for output of four cows, and ii) the power available from the digester. Retention time is 20 days and temperature 30 ^0C, Dry matter consumed is ~~is 2 kg/day~~, biogas yield 0.24 m^3 per kg. Burner efficiency is 60% methane proportion is 0.8. Heat of combustion of methane may be assumed to be 28 MJ/m^3. [10]

2kg/day/cow & density 50%

[TURN OVER

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4. a) Explain energy status of India Maharashtra and role of NCES. [08]
   b) A geothermal site of size 70 Km^2 and depth 2 Km, has temp. of 240 ^0C, and volumetric sp. Heat of 2.51J/cm^3 ^0C. Find energy content in Joules, if surface temp. is 30^0C and for how many years site can provide power for a 2500 MWe plant if conversion efficiency is 1.6% [08]
   c) What is district heating? [04]

5. a) What are the advantages and limitations of tidal power generation? [06]
   b) What are reaction phases taking place in a digester? [06]
   c) What is Beltz coefficient? Derive its value. [08]

6. Answer any four. [20]
   a) What is Wave energy?
   b) What are advantages and disadvantages of wind power?
   c) What is Open cycle OTEC plant?
   d) What is Producer gas?
   e) Define i) solar constant, ii) angle of declination.