

Student Exam No: _____

GANPAT UNIVERSITY

B.TECH SEM. VIII - MECHANICAL ENGINEERING

REGULAR EXAMINATION MAY/JUNE 2012

SUBJECT WITH CODE: - ME -801 ALTERNATIVE ENERGY SOURCES

TIME: - 3 HOURS

TOTAL MARKS:-70

INSTRUCTIONS: 1. Attempt all questions from both the sections.

2. Answers to the two sections must be in separate answer book.

3. Figures to the right indicate full marks of the question.

4. Draw neat sketches and assume suitable additional data, if necessary.

Section - I

Que.-1

- (a) Data for a flat plate collector used for heating the building are given below: 08

Factor	Specification
Location and latitude	Baroda 22° N
Day and time	January 1, 11:30 – 12:30 (IST)
Annual average intensity, of solar radiation	0.5 langley/min
Collector tilt	Latitude + 15°
No. of glass covers	2
Heat removal factor for collector	0.810
Transmittance of the glass	0.88
Absorptance of the glass	0.90
Top loss coefficient for collector	7.88 W/m ² °C (6.80 kcal/hr m ² °C)
Collector fluid temperature	60°C
Ambient temperature	15°C

Calculate : (1) Solar altitude angle
(2) Collector efficiency.

- (b) Explain Pyranometer with a neat sketch. 04

OR

Que.-1

- (a) Classify solar collectors. Discuss advantages of Concentrating collectors over Flat-plate collectors. 06

(b) Define the following terms :

(i) Surface azimuth angle (ii) Declination (iii) Hour angle

06

Que.-2

(a) Calculate the hour angle at sunrise and sunset on June 21 and December 21 for a surface inclined at an angle of 10° and facing due south. The surface is located in Mumbai ($19^\circ 07' N$ $72^\circ 51' E$).

06

(b) Write note on Solar Distillation.

05

OR

Que.-2

(a) What is the principle of solar photovoltaic power generation? What are the main elements of a PV system?

06

(b) What is Solar pond? Explain Solar pond with a neat diagram.

05

Que.-3

(a) Explain in brief "Alternative energy sources"

06

(b) Discuss merits and demerits of solar energy. Enumerate the different main applications of solar energy.

06

Section - II

Que.-4

(a) What is Bio gas? Draw and explain any one bio gas plant.

06

(b) The following data are given for a family biogas digester suitable for the output of four cows: the retention time is 20 days, temperature $30^\circ C$, dry matter consumed per day = 2 kg, biogas yield is $0.24 \text{ m}^3/\text{kg}$. The efficiency of burner is 60 %, methane proportion is 0.8. Heat of combustion of methane = 28 MJ/ m^3 at STP. Calculate: (i) the volume of biogas digester and (ii) the power available from the digester.

06

OR

Que.-4

(a) State the principle of OTEC. Explain open cycle OTEC plant.

05

(b) Prove that in case of horizontal axis wind turbine, maximum power can be obtained, When Exit velocity = $(1/3)$ Wind velocity

07

$$P_{\max} = (8/27) \rho A V^3$$

Que.-5

- (a) How tides are formed? Explain Double basin tidal plant. 06
- (b) Write uses and advantages of geothermal energy. 05

OR

Que.-5

- (a) What do you mean by Energy management? Discuss 'Energy audit' in detail. 06
- (b) Describe the main considerations in selecting a site for wind generators. 05

Que.-6

- (a) What is the principle of MHD plant? Describe Open cycle MHD plant. 06
- (b) With a neat sketch explain Liquid dominated geothermal plant. 06

END OF PAPER