

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), April-May 2018

B. Tech in Mechanical Engineering, Semester VI

Roll No.....

ME606: Renewable Energy Technology

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Short answer/objective type questions (10 questions @ 1 mark) 10

- i. What is percentage share of fossil fuel in global consumption of primary energy?
A. 82% B. 50% C. 10% D. 99%
- ii. Global warming would lead to:
A. Increase of agriculture production B. Acid rains
C. Change of climatic pattern and its severity
D. Increase in the efficiency of heat engines
- iii. What percentage of electrical power is presently being produced by non-conventional energy sources in India?
A. 17 B. 37 C. 47 D. 27
- iv. A horizontal surface receives
A. no reflected component of radiation.
B. 50% of the reflected component of radiation.
C. 50% of the issued component of radiation.
D. 50% of the main component of radiation.
- v. On September 21, the declination angle will be
A. zero B. 23.45° C. -23.45° D. 180°
- vi. Terrestrial radiation has a wavelength in the range of
A. $0.2 \mu\text{m}$ to $4 \mu\text{m}$ B. $0.2 \mu\text{m}$ to $0.5 \mu\text{m}$
C. $0.38 \mu\text{m}$ to $0.76 \mu\text{m}$ D. $0.29 \mu\text{m}$ to $2.3 \mu\text{m}$
- vii. A solar thermal collector
A. collects the solar energy and reflects it back.
B. exhaust the solar radiation and dissipate it to the ambient.
C. collects and converts the solar energy into electrical energy.
D. collects and covers the solar energy into thermal energy and deliver it to heat transfer fluid.
- viii. The value of heat removal factor F_R of the flat plate collector lies in range
A. 0 to 0.1 B. 0 to 1 C. 0.9 to 0.95 D. 0.5 to 0.6
- ix. For heating applications during winter in Northern hemisphere, for optimal gain, the collector tilt angle must be fixed at
A. ϕ B. $(\phi - 10^\circ)$ or $(\phi - 15^\circ)$
C. $(\phi + 10^\circ)$ or $(\phi + 15^\circ)$ D. $+10^\circ$ or $+15^\circ$

- x. In evacuated tube collectors
 A. both conductions as well as convection losses are suppressed.
 B. only conductions losses are suppressed.
 C. only convections losses are suppressed.
 D. only radiation losses are suppressed.
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- Name any 5 renewable energy resources.
 - What do you mean by Associated gas?
 - Define plant load factor.
 - Why year 1973 is considered as crucial year in the field of energy?
- Q.3A Plot per capita needs of electricity in the future. Also point out the share of renewable energy in future. How renewable energy could be helpful in saving fossil fuel. 2 + 1 + 2
- Q.3B Write a short note on geothermal energy as a nonconventional energy source. 05
- Q.4 Explain the process of collecting the solar energy in the flat plate collectors. Point out the differences between flat plate collector and evacuated tube collector. 6 + 4
- Q.5 Explain any two of the following in detail: 05
- Parabolic concentrating collector +
 - Linear Fresnel collector 05
 - Paraboloid concentrating collector
- Q.6A Make suitable assumptions and estimate the collector area required for an 80 MWe line-focusing solar thermal power plant producing electricity for 8 hours every day. 05
- Q.6B Explain in detail any one of the following given solar thermal applications: 05
- Distillation
 - Drying
- Q.7A 'Electrical energy is the superior form of energy'. Comment your views in favour of this argument. 05
- Q.7B 'Renewable energy - The future for India'. Comment your views in favour or against of this argument. 05
- OR**
- Define following terms: 05
- Hour angle
 - Air mass
 - Global radiation
- Q.8 Calculate the angle made by beam radiation with the normal to a flat plate collector on May 1 at 0900 h (local apparent time). The collector is located in New Delhi ($28^{\circ}35'N, 77^{\circ}12'E$). It is tilted at an angle of 36° with the horizontal and pointing due south. 10

- Q.9 Discuss any two of the following topics in detail: 10
- A. Central receiver type high temperature solar power plant. +
 - B. Instrument for measuring solar radiation. 10
 - C. Box type solar cooker with one reflector.