

IV B.Tech. II Semester Supplementary Examinations, July -2005
NON-CONVENTIONAL SOURCES OF ENERGY
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the followings:
 - i. Solar time
 - ii. Solar altitude
 - iii. Zenith angle(b) Determine the local solar time corresponding to 10.00 am IST on February 8 for a location at 87.5° east longitude.
2. Explain the construction of reflectors and the materials used for concentrating collectors.
3. (a) With neat sketch, explain the suitability of solar dryer for food grains.
(b) With a neat sketch, explain the working of solar distillation plant.
4. (a) How do you measure the speed and the direction of a wind? Explain in detail.
(b) What are the various characteristics of the wind? Discuss them in detail.
5. (a) What are the different phases of anaerobic digestion? Explain.
(b) Write about the bio-chemical processes that occur in anaerobic digestion.
6. (a) What is geothermal energy? Explain.
(b) Give the classification of different geothermal sources in detail.
7. (a) Explain the closed cycle OTEC system with advantages and disadvantages over the open cycle OTEC plant.
(b) Estimate the amount of electrical energy obtained from an OTEC plant working with surface water at 27°C and with a temperature difference of 15°C . Assume the density of ocean water as $1010\text{kg}/\text{m}^3$, specific heat of water as 4200 J/kg K , turbine efficiency is 0.75, generator efficiency is 0.96 and diameter of tube is 60 cm, when the velocity of water is limited to 0.2 m/s
8. With neat sketches explain the working of wave energy conversion machines.

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1. (a) Calculate daylength at location (latitude $28^{\circ}35'N$, longitude $77^{\circ}12'E$) on December 1.
(b) Assuming the earth' solar constant to be $4871KJ/Cm^2hr$, calculate the equivalent surface temperature of the sun, if the sun is assumed to be block body radiator.
2. Write short notes on:
 - (a) Solar radiation measurements
 - (b) Temperature measurements
 - (c) Liquid flow measurements
3. (a) With suitable sketches explain the working of a solar cell.
(b) What are the various materials used for solar cells.
4. A wind mill is to be used to supply the electric power needs of a house hold at a location where the average wind speed is 6 m/s. What size rotor would be required if 1 Kw is to be provided. Assume a rotor efficiency of 70%, gearing efficiency of 92%, generator efficiency of 80% and storage efficiency of 85% with an air density of $1.2Kg/m^3$.
5. What are the applications of biogas? Can it be used as a fuel in IC engines? What are the modifications required in the regular SI and CI engines to adapt biogas as a fuel. Is it economical to use it for IC engines?
6. (a) Give a brief account of different arrangements used in geo thermal-fossil (hybrid) plants?
(b) With the help of neat diagram, explain the working of fossil-super heat hybrid system.
7. (a) Explain the operation and advantages of single pool modulated tidal system as compared to unmodulated system.
(b) Discuss on the difficulties and limitations in tapping OTE on a commercial scale.
8. (a) What is the basic principle of Direct Energy Conversion systems?
(b) Describe briefly the working of a thermoelectric generator. Explain Seebeck, Peltier, Joule and Thomson effects.

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1. (a) Explain the followings:
 - i. Solar time
 - ii. Solar altitude
 - iii. Zenith angle
- (b) Determine the local solar time corresponding to 10.00 am IST on February 8 for a location at 87.5° east longitude.
2. (a) Classify and describe in brief the solar air heaters.
- (b) Sketch the various solar drier designs.
3. (a) With a neat sketch, explain the suitability of solar dryer for the products like Tea and Tobacco.
- (b) With a neat sketch, explain the working of solar water heater.
4. (a) How do you measure the speed and the direction of a wind? Explain in detail.
- (b) What are the various characteristics of the wind? Discuss them in detail.
5. (a) Explain the classification of biomass resources.
- (b) How the biomass conversion takes place? What is the difference between biogas and biomass?
6. (a) What are the advantages and disadvantages of geo thermal energy over other energy forms?
- (b) Discuss the applications of geo thermal energy.
7. (a) With a schematic diagram, explain briefly the working of open cycle OTEC plant.
- (b) With reference to typical examples, explain the nature and magnitude of energy possessed by ocean tides.
8. Describe briefly the working of a thermoelectric generator.

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1. (a) Explain the followings:
 - i. Solar time
 - ii. Solar altitude
 - iii. Zenith angle(b) Determine the local solar time corresponding to 10.00 am IST on February 8 for a location at 87.5° east longitude.
2. Write short notes on:
 - (a) Selecting absorber coatings
 - (b) Materials for flat plate collectors
 - (c) Evacuated solar collectors
3. (a) With neat sketch, explain the suitability of solar dryer for food grains.
(b) With a neat sketch, explain the working of solar distillation plant.
4. Write short note on the following:
 - (a) Performance of a wind mill.
 - (b) Savonius rotor wind mill.
 - (c) Cup anemometer.
 - (d) Darrius rotor.
5. What are different biomass conversion technologies? Write about them in detail.
6. (a) What are hydrothermal resources? Explain.
(b) Write about the vapor dominated system. With the help of a neat diagram explain the working of a vapor-dominated power plant.
7. (a) With reference to neat layout diagrams, explain the operation of a closed cycle OTEC plant.
(b) Find the quantity of water to be pumped to OTEC plant working with surface water at 27°C and with cold water at 8°C at a depth of 600 m from the surface to obtain 1.0 MW of thermal energy. Assume the density of ocean water as 1010 kg/m^3 and the specific heat of water as 4200 J/kg K .

8. Show by sketches the method of harnessing the energy potential associated with ocean tides.

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