# Kadi Sarva Vishwavidyalaya

B.E. Sem IV (Mechanical Engg./Automobile Engg.) Examination April 2015

Subject: Non Conventional Energy Sources. (ME 403/AE 403)

Date: 02nd May, 2015 Max. Marks: 70 Time: 3 Hrs.

Instruction: (1) Use of Scientific calculator is permitted.
(2) Assume suitable data if necessary.

## Section – I

**Q.1** **Each carries equal marks**

[A] What is meant by renewable energy sources? What are the prospects of non-conventional energy sources in India? [5]

[B] Define terms: Altitude angle, Incident angle, Zenith angle, Solar Azimuth angle, Surface Azimuth angle, latitude angle, Declination angle, Hour Angle, Tilt angle. [5]

[C] Calculate the number of Sunshine hours in Gandhinagar on 1st January and 1st July. [5]

**OR**

[C] Calculate the solar insolation on the top of the atmosphere on 23 March and 19 June, 2015. Take Solar constant = 1353 $W/m^2$. [5]

**Q.2**

[A] Define beam, diffused and global radiation. Derive an expression for total radiation on an inclined surface. Show that a horizontal surface receives no ground-reflected radiation. [5]

[B] Discuss the working of a basic type solar still with the help of a nest sketch. Define efficiency of solar still. [5]

**OR**

**Q.2**

[A] What is solar time and why it is different from the standard clock time of a country? Also derive an expression for solar day length. [5]

[B] What is Sunshine recorder? Explain with the help of diagram. [5]

**Q.3**

[A] How the solar water heating systems are classified? Explain the working of thermo-syphon solar water heating system with the help of a neat sketch. [5]

[B] Discuss the need of energy conservation in view of the effect on global warming scenario. [5]

**OR**

**Q.3**

[A] Explain following terms: - Energy conservation, Energy management, energy audit, energy efficiency, energy security. [5]

[B] What is the difference between an active and passive solar heating system? [5]

## Section – II

**Q.4** **Each carries equal marks**

[A] Describe with neat figure Vapour Dominated (dry steam) type geothermal power plant. [5]

[B] How are biomass gasifiers classified? With a neat sketch explain any one. [5]

[C] Explain how a selection criterion of heat exchangers is done in O.T.E.C. system. [5]

**OR**

[C] Derive an equation for maximum power, maximum torque and maximum axial thrust available from wind turbine. What is Optimum velocity? [5]

**Q.5**

[A] Tidal power plant of single basin type has a basin area of 25 x $10^6$ sq.m.The tide has a range of 10 m. The turbine however, stops operating when the head on it falls below 2m.calculate the energy generated in on filling process in kwh if the turbine generator efficiency is 75%(take sea water density=1025 kg/cu.m [5]

[B] State the advantages and disadvantages of Magneto hydrodynamic (MHD) system. [5]

**OR**

**Q.5**

[A] Discuss with neat sketch power duration and velocity duration characteristics of a wind. [5]

[B] Write a short note on Tidal power plant with single basin system. [5]

Q.6

[A] Describe the utilization of vapour dominated hydrothermal fluid for power generation with a neat sketch. [5]

[B] Explain effect of following factors on performance of biogas generation. [5]

i. PH value.
ii. Diameter to depth ratio.
iii. Pressure.
iv. Seeding.

**OR**

Q.6

[A] Explain the following wave energy conversion devices with neat sketches: Float wave energy conversion device, dolphin type wave generator. [5]

[B] Classify the Wind Mills and explain Horizontal Axis Wind Mill. [5]

*******END OF PAPER*******

# Kadi Sarva Vishwavidyalaya

B.E. Sem IV (Mechanical Engg./Automobile Engg.) Examination October 2015

Subject: Non Conventional Energy Sources. (ME 403/AE 403)

Date: 27th October, 2015 Max. Marks: 70 Time: 3 Hrs.

Instruction: (1) Use of Scientific calculator is permitted.
(2) Assume suitable data if necessary.

## Section – I

**Q.1** **Each carries equal marks**

[A] Write short note on classification of energy resources. Also explain which type of Alternate Energy Source is the best suitable for rural and agricultural applications and why? [5]

[B] Calculate the solar insolation on the top of the atmosphere on 23 September and 19 December, 2015. Take Solar constant = 1353 $W/m^2$. [5]

[C] Define terms: Altitude angle, Incident angle, Zenith angle, Solar Azimuth angle, Surface Azimuth angle, latitude angle, Declination angle, Hour Angle, Tilt angle. [5]

**OR**

[C] Calculate the number of Sunshine hours in Gandhinagar on 1st April and 1st November. [5]

**Q.2**

[A] Define beam, diffused and global radiation. Derive an expression for total radiation on an inclined surface. Show that a horizontal surface receives no ground-reflected radiation. [5]

[B] Write a brief note on effect of various parameters on performance of flat plate collectors. [5]

**OR**

**Q.2**

[A] How solar air collectors are classified? What are the main applications of a drier? [5]

[B] What is the difference between an active and passive solar heating system? [5]

**Q.3**

[A] Define the term 'Solar Constant'. Explain the variation of solar constant with the time of the year. [5]

[B] Write a difference between Conventional steam power plant and Geothermal power plants. [5]

**OR**

**Q.3**

[A] Write on energy economics, energy audit and energy planning. [5]

[B] What is Sunshine recorder? Explain with the help of diagram. [5]

## Section – II

**Q.4** **Each carries equal marks**

[A] Describe with neat figure Vapour Dominated (dry steam) type geothermal power plant. [5]

[B] How bio-gas plants classified? Explain fixed dome type domestic biogas plant. [5]

[C] Explain the principle of open cycle OTEC system with suitable diagram. [5]

**OR**

[C] Give detailed classification of Wind Mills. [5]

**Q.5**

[A] Define the term 'Tidal range". Explain 'Double basin tidal power plant'. [5]

[B] Calculate the open circuit voltage and maximum power output of MHD engine with following specifications. [5]
Plant area=0.2 sq.m, Distance between plates=0.4m.
Flux density=2 wb/sq.m, Average gas velocity =1000m/sec
Conductivity of gas=10 mho/m.

**OR**

**Q.5**

[A] Prove that in case of Horizontal Axis Wind Turbine maximum power can develop when exit velocity = 1/3 of wind velocity and Pmax = $8\ \rho A V i^3/27$ [5]

[B] Tidal power plant of single basin type has a basin area of $25 \times 10^6$ sq.m.The tide has a [5]

range of 10 m. The turbine however, stops operating when the head on it falls below 2m.calculate the energy generated in on filling process in kwh if the turbine generator efficiency is 75%(take sea water density=1025 kg/cu.m

**Q.6**

[A] Write on working of MHD system with neat sketch. [5]

[B] Describe the main considerations for selection of site for a Biogas Plant. [5]

**OR**

**Q.6**

[A] Explain power in ocean wave. Enlist the various wave energy converters? Write advantages and disadvantages of wave energy. [5]

[B] Write brief note on Performance Characteristic of Wind machine. [5]

*******END OF PAPER*******