

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: EE367

**Course Name: NEW AND RENEWABLE SOURCES OF ENERGY
(EE)**

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

- | | | Marks |
|---|--|-------|
| 1 | What is the present status of various modes of renewable power generations in India. Explain. | (5) |
| 2 | Define and explain the following angles as related to solar geometry:
(i) Surface azimuth angle (ii) Declination angle (iii) Latitude angle | (5) |
| 3 | Draw and Explain the VI characteristics of a solar cell. How does temperature affect the performance of solar cell? | (5) |
| 4 | List out any five merits and demerits of OTEC. | (5) |
| 5 | Discuss the different types of wind turbine rotors used to extract wind. | (5) |
| 6 | Explain the terms solidity, pitch angle, tip speed ratio, cut-in speed and cut speed of wind turbine | (5) |
| 7 | With a neat diagram, explain the working of biogas plant | (5) |
| 8 | What are the components of a micro hydel power plant | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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|----|--|-----|
| 9 | a) Explain various energy storage systems. Give advantages and disadvantages of each. | (6) |
| | b) List the merits and de-merits of non-conventional energy resources | (4) |
| 10 | a) Find the hour angle at the sunrise and the sunset on March 22 for a surface inclined at an angle of 20° facing south at New Delhi ($28^{\circ} 35' N$, $77^{\circ} 12' E$). | (6) |
| | b) Explain the principle, working and components of a solar flat plate collector | (4) |
| 11 | a) Explain the principle and working of the following solar radiation measuring instruments:
(i) Pyranometer (ii) Pyrhelimeter and (iii) Sunshine recorder | (7) |
| | b) What is solar constant? Explain. | (3) |

PART C

Answer any two full questions, each carries 10 marks.

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|----|---|------|
| 12 | Discuss the basic principle of OTEC. Describe a closed cycle OTEC with its advantages and disadvantages. | (10) |
| 13 | a) Explain various types of tidal power plants. | (5) |
| | b) Classify solar cell based on the type of material used. Explain each one. | (5) |
| 14 | a) Draw and explain the block diagram of a standalone solar PV power system | (5) |
| | b) A certain PV cell is illuminated with an irradiance of 1000 W/m^2 . If the cell is $100 \text{ mm} \times 100 \text{ mm}$ in size and produces 3 A at 0.5 V at the maximum power point. What is the conversion efficiency? | (3) |
| | c) What is maximum power point tracking? | (2) |

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Prove that the maximum wind turbine output can be achieved when $V_d = 1/3 V_u$, (6)
where V_d and V_u are down-stream and up-stream wind velocity respectively.
- b) What is pitch control of wind turbine? Explain. (4)
- 16 a) Explain any two types of biogas plants? Discuss the factors which decide the (5)
quality of biogas.
- b) Determine the power output of a wind turbine whose blades are 12 m in diameter (5)
and when the wind speed is 6 m/s, the air density is about 1.2 kg/m^3 and the
maximum power coefficient of the wind turbine is 0.35.
- 17 a) With a neat schematic diagram, explain the biomass gasification based electric (5)
power generation system.
- b) Describe the working and constructional features of PEM fuel cell. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code:EE367

Course Name: NEW AND RENEWABLE SOURCES OF ENERGY (EE)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks

Marks

- | | | |
|---|---|-----|
| 1 | Explain how current scenario of world energy consumption leads to the exploitation of renewable energy sources? | (5) |
| 2 | Define the terms solar constant, solar altitude angle and solar azimuth angle? | (5) |
| 3 | Draw the V-I characteristics of a solar cell and list out the factors affecting the electricity produced by a solar cell? | (5) |
| 4 | Compare different types of solar cells with reference to their construction and efficiency. | (5) |
| 5 | Derive the expression for power in the wind. Define the term capacity factor of wind power plant. | (5) |
| 6 | Explain the lift and drag forces in wind and its importance in wind power generation. | (5) |
| 7 | Explain the design and selection of different types of turbines used for small hydro plants. | (5) |
| 8 | Explain how fuel cell works as a renewable energy source. | (5) |

PART B

Answer any two full questions, each carries 10 marks

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|----|---|-----|
| 9 | a) Elaborate the availability and limitations of conventional sources of energy and its impact on human life. What are the alternate solutions? | (5) |
| | b) Explain the non-conventional energy resources available in Indian energy scenario. | (5) |
| 10 | a) With the aid of a neat diagram, explain the working of a central tower collector type solar thermal electric plant. | (5) |
| | b) Explain the necessity of energy storage in renewable power harnessing? Give the diagram and explain the operation of a pumped energy storage system. | (5) |
| 11 | a) Distinguish between concentrating and non-concentrating type solar collectors and also draw the schematic diagram of a flat plate collector. Explain its working. | (5) |
| | b) For a solar PV installation it is necessary to measure the global solar irradiance of the site. Suggest a suitable solar measuring instrument and explain its working. | (5) |

PART C

Answer any two full questions, each carries 10 marks

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|----|--|------|
| 12 | Explain the principle of operation of a tidal power plant. How it is classified? Draw the layout of a double basin tidal power plant and label all the components. Explain the function of each component. | (10) |
|----|--|------|

- 13 Explain stand-alone and grid connected solar PV systems? Explain each type with the help of block diagram and bring out their relative merits. (10)
- 14 What are the site selection criteria for OTEC? Draw the block diagram and explain the working of Anderson cycle based OTEC system. Explain how biofouling affects efficiency of energy conversion and how can it be minimised? (10)

PART D

Answer any two full questions, each carries 10 marks

- 15 a) Give the site selection criteria for wind plants and write a note on wind energy potential in India. (5)
- b) Draw the block diagram of a typical wind energy conversion system and explain the working of wind power plant. (5)
- 16 a) Explain how wind power plants are classified. Explain vertical axis wind turbine with necessary diagrams. (5)
- b) Describe how energy is harnessed from satellite stations. (5)
- 17 a) Explain the how urban waste is converted into useful energy. (5)
- b) Explain the process of anaerobic digestion of biomass into biogas. Draw the schematic diagram of a biodigester. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE367

Course Name: NEW AND RENEWABLE ENERGY SYSTEMS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|--|-----|
| 1 | What is the necessity of energy storage? | (5) |
| 2 | Define i) declination angle ii) inclination angle iii) tilt angle iv) angle of incidence and v) zenith angle | (5) |
| 3 | Draw and Explain the equivalent circuit of a practical solar cell | (5) |
| 4 | Explain the principle of tidal power generation. | (5) |
| 5 | Discuss the factors affecting the wind speed at an area. | (5) |
| 6 | List the advantages and disadvantages of wind energy conversion system. | (5) |
| 7 | Draw the schematic of a KVIC type of bio gas plant | (5) |
| 8 | Briefly explain the power generation from satellites. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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| 9 | a) Explain mechanical and chemical methods of energy storage. | (6) |
| | b) Describe construction and working of a Pyranometer. | (4) |
| 10 | a) Discuss the current world and Indian energy scenario. | (5) |
| | b) What are the factors which affect the performance of a solar thermal collector. | (5) |
| 11 | a) Differentiate between flat plate collectors and solar concentrators and compare their performance based on concentration ratio, collector efficiency and temperature range. | (6) |
| | b) Compare conventional and non-conventional sources of energy. | (4) |

PART C

Answer any two full questions, each carries 10 marks.

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|----|--|-----|
| 12 | a) Draw the block diagram of a solar thermal electric plant and explain its working | (6) |
| | b) List the advantages and limitations of tidal power plant | (4) |
| 13 | a) Compare the working of an open cycle, closed cycle and hybrid cycle OTEC plants with neat sketches. | (6) |

- b) Discuss the effect of temperature and insolation on the characteristics of a solar cell. (4)
- 14 a) Briefly explain the applications of a solar PV system. (5)
- b) Differentiate between ebb generation and flood generation in tidal plants (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Draw the block diagram of a wind energy conversion system and explain the parts and their functions (6)
- b) Explain the production of ethanol from biomass for fuel applications. (4)
- 16 a) Write brief notes on any three types of gasifiers used for biomass to fuel conversion. (6)
- b) Draw the layout of a micro hydro project. (4)
- 17 a) Derive the expression for power extracted from wind. (5)
- b) Explain any one type of fuel cell. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE367

Course Name: NEW AND RENEWABLE ENERGY SYSTEMS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

		Marks
1	What are energy resources? How are they classified?	(5)
2	What is solar constant? What is the expression for solar constant?	(5)
3	Draw and explain a PV based solar pumping system.	(5)
4	What are the advantages and disadvantages of ocean thermal energy conversion systems?	(5)
5	Define the following terms i) Cut in speed ii) Pitch Control iii) Solidity	(5)
6	Give a comparison between horizontal and vertical axis wind machines.	(5)
7	What is anaerobic digestion? Explain briefly.	(5)
8	What are fuel cells? Mention few applications of fuel cells.	(5)

PART B

Answer any two full questions, each carries 10 marks.

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|----|--|-----|
| 9 | a) What are the different instruments used for the measurement of solar radiation? Explain in detail. | (8) |
| | b) What are the advantages and disadvantages of conventional energy resources? | (2) |
| 10 | a) What is the principle of conversion of solar energy into heat? What are solar thermal collectors? What are the characteristic features of a collector system? | (7) |
| | b) Calculate the sunset hour angle and day length at location latitude of 35°N, on Feb 14. | (3) |
| 11 | a) Describe the energy scenario in India. What are the various non-conventional energy resources relevant to India? | (5) |
| | b) What are concentrating collectors? What is the need for orientation in concentrating collectors? Explain briefly the various types of concentrating collectors. | (5) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Describe a stand-alone PV system. (4)
b) Describe a hybrid cycle OTEC system. (6)
- 13 a) What are the major components of a tidal power plant? (6)
b) What is biofouling? How can it be prevented? (4)
- 14 a) How are tidal power plants classified? With neat diagrams, explain the working of each. (8)
b) What is a module, array and panel with reference to a solar PV system. (2)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) The following data relate to a wind turbine: (6)
Velocity of wind at 15⁰C= 10 m/s
Turbine diameter=10m
Operating speed of the machine=35 rpm at maximum efficiency of 40%
Calculate: i) total power density in the wind stream
ii) The maximum power density
iii) The actual power density
iv) Power output of the turbine
- b) Prepare a brief note on emerging technologies in the field of renewable energy. (4)
- 16 What are biomass resources? Enumerate the processes which are used for biomass conversion. (10)
- 17 a) What are the two fundamental mechanisms to produce force from the wind? (5)
What are the advantages and disadvantages of a wind energy conversion system?
- b) What is small hydro power? How is it classified? Obtain an expression for the power that can be generated from a small hydro power station. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code:EE367

Course Name: NEW AND RENEWABLE ENERGY SYSTEMS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

- | | | Marks |
|---|---|-------|
| 1 | Discuss advantages and limitations of conventional energy sources | (5) |
| 2 | Define Solar Constant. Calculate the number of daylight hours in Srinagar for 22 nd June .The latitude of Srinagar as 34°05'N. | (5) |
| 3 | Define (i) Open Circuit Voltage (ii) Short circuit Current (iii) Fill factor and (iv) Efficiency of the solar cell | (5) |
| 4 | Differentiate between Closed cycle and Anderson cycle OTEC | (5) |
| 5 | Explain the principle of wind energy conversion system with block diagram | (5) |
| 6 | List advantages and disadvantages of wind energy conversion system. | (5) |
| 7 | What is meant by small hydro project? Give its classifications. | (5) |
| 8 | Briefly explain the hydrogen energy system with necessary diagram | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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|----|---|-----|
| 9 | a) Write short notes on the advantages and disadvantages of any three types of non conventional energy sources. | (6) |
| | b) Draw and explain the operation of flat plate collectors | (4) |
| 10 | a) Compare the construction and working of Pyranometer and Pyrliometer. | (5) |
| | b) Explain the thermal methods of energy storage. | (5) |
| 11 | a) Derive the equation for collector efficiency of a flat plate collector. | (6) |
| | b) Discuss the Indian Energy scenario. | (4) |

PART C

Answer any two full questions, each carries 10 marks.

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|----|--|-----|
| 12 | a) Draw the block diagram of a solar thermal electric plant and explain its working. | (6) |
| | b) What are the factors affecting the site selection of OTEC. | (4) |
| 13 | a) Classify tidal power plants and brief explain any two of them. | (6) |

- b) Explain stand-alone PV system with necessary diagram (4)
- 14 a) Discuss the effect of temperature and insolation on the characteristics of solar cell. Draw the P-V characteristics of Solar cell under varying temperature and irradiation level (6)
- b) What is meant by “*bio fouling*” and what is effect on OTEC. What are the methods used avoid this problem. (4)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Write brief notes on the classification of wind energy conversion system (6)
- b) Explain the production of producer gas from biomass. (4)
- 16 a) Compare the construction and performance of floating drum type and fixed dome type biogas plants with the help of neat sketches. (6)
- b) Explain the factors that affect the nature of wind in an area. (4)
- 17 a) Derive the expression for power output of a wind turbine. (6)
- b) Discuss the selection criteria of turbines for a small hydro project. (4)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE367**Course Name: New and Renewable Energy Systems**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

- 1 What is the present status of various modes of renewable power generations in India? Explain. (5)
- 2 Differentiate between Pyranometer and Pyrhelimeter. (5)
- 3 Explain the practical equivalent circuit of a solar cell. (5)
- 4 With the help of a block diagram explain the working of a hybrid OTEC. (5)
- 5 List out the advantages and disadvantages of wind energy conversion systems. (5)
- 6 Classify wind power plants based on principle of operation. (5)
- 7 With neat figure explain the working of a KVIC biogas plant. (5)
- 8 What are the factors that affect biogas generation (5)

PART B*Answer any two full questions, each carries 10 marks.*

- 9 a) Elucidate the necessity of energy storage in the context of renewable sources of energy (5)
b) Compare between conventional and non-conventional energy resources (5)
- 10 a) Explain the following terms related to solar geometry (4)
(i) Hour Angle (ii) Altitude Angle (iii) Zenith Angle (iv) Surface azimuth angle
b) Explain the working of a central tower collector with a neat diagram (6)
- 11 a) Explain sizing and necessity with reference to energy storage (5)
b) Explain construction of solar flat plate collector with a neat diagram (5)

PART C*Answer any two full questions, each carries 10 marks.*

- 12 a) Explain any two application of solar PV systems with block diagrams. (6)
b) With a neat diagram explain the Grid connected PV systems (4)
- 13 a) List out the advantages and disadvantages of a tidal power plant (4)
b) Explain the site-selection criteria for OTEC plants (3)

- (c) What is biofouling with reference to OTEC power plants (3)
- 14 a) With a neat diagram explain solar cell characteristics. (4)
- b) Classify tidal power plants based on the type of basin used. (6)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Derive the expression for power in the wind turbine. (6)
- b) Explain yaw control mechanism. (4)
- 16 a) What are different technologies used in biomass to energy conversion (6)
- b) Explain the working principle of a fuel cell. (4)
- 17 a) Explain the importance of biomass programme in India (4)
- b) With a neat diagram explain the construction of a propeller type wind power system (6)
