



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:<br>(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 $20^\circ$ 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:<br>(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 $1000 \text{ W/m}^2$ . If the cell is $100 \text{ mm} \times 100 \text{ mm}$ in size and produces $3 \text{ A}$ at $0.5 \text{ V}$ 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  $1.2 \text{ kg/m}^3$  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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## PART B

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

## PART C

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