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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MASTERS OF TECHNOLOGY (M.Tech)

(SEM: FIRST; Theory Examination   (2020-2021)

SUBJECT NAME: RENEWABLE ENERGY SYSTEM

Time: 3Hours   **Max. Marks: 70**

General Instructions:

➢ All questions are compulsory. Answers should be brief and to the point.
➢ This Question paper consists of ...03...pages & ...08.........questions.
➢ It comprises of three Sections, A, B, and C. You are to attempt all the sections.
➢ **Section A** -Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
➢ **Section B** - Question No-3 is Long answer type -I question with external choice carrying 4marks each. You need to attempt any five out of seven questions given.
➢ **Section C** -Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 7marks each. You need to attempt any one part *a or b.*
➢ Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
➢ No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A

1.	**Answer all the parts-**	**[5x1=5]**	**CO**

a. Based on the following options, choose the correct option.   **(1)   CO1**

Statement I: Non-Conventional energy is available in nature free of cost.

Statement II: Non-Conventional energy is exhaustible in nature.

a) Statement I and Statement II are correct and Statement II is the correct explanation of Statement I

b) Statement I and Statement II are correct and Statement II is not the correct explanation of Statement I

c) Statement I is true and Statement II is false

d) Statement II is true and Statement I is false

b. _____ is a petrochemical and is used as raw material for chemical, pharmaceutical,   **(1)   CO2**
and paint industry.

a) Plutonium
b) Uranium
c) Coal
d) Protactinium

c. In a medium or high – head hydro-electric power plant, a surge tank is provided to   **(1)   CO3**

(i) Reduce the length of penstock.
(ii) Augment water at fore bay.
(iii) Control the pressure variation in penstock pipes.
(iv) Control the water flow through turbines.

d.	Which of the following forestry materials can be used as biomass?	(1)	CO4
	(i) Logging residues		
	(ii) Tallow		
	(iii) Fish oil		
	(iv) Manure		
e.	The amount of energy available in the wind at any instant is proportional to ___ of the wind speed.	(1)	CO5
	(i) Square root power of two		
	(ii) Square root power of three		
	(iii) Square power		
	(iv) Cube power		

2. Answer all the parts-   [5×2=10]   CO

a.	Compare between conventional and non-conventional energy resources.	(2)	CO1
b.	Explain the practical equivalent circuit of a solar cell.	(2)	CO2
c.	What are the advantages of mini/micro hydro resources?	(2)	CO3
d.	What are the factors that affect biogas generation?	(2)	CO4
e.	What is Energy Systems Integration? Explain with an example.	(2)	CO5

SECTION – B

3. Answer any five of the following-   [5x4=20]   CO

a.	Elucidate the necessity of energy storage in the context of renewable sources of energy.	(4)	CO1
b.	Describe the layout and working of continuous solar cooling system.	(4)	CO2
c.	Define (i) Open Circuit Voltage (ii) Short circuit Current (iii) Fill factor and (iv) Efficiency of the solar cell	(4)	CO2
d.	Compute in kg weight of coal saved per annum by a hydroelectric plant operating at an annual average capacity of 8000 kW, supposing the fuel consumption of the substituting thermal plant is 3500 Cal/kWh, and the quality of coal is characterized by 4000 Cal/kg.	(4)	CO3
e.	Explain the process of production of biogas from biomass. What are the main advantages of anaerobic digestion of biomass?	(4)	CO4
f.	Write a note on design of integrated energy systems.	(4)	CO5
g.	Describe with neat sketch the working of a horizontal axis wind turbine.	(4)	CO5

SECTION – C

4 Answer any one of the following-   [5×7=35]   CO

a.	How is per capita energy consumption related with standard of living or development of a country? Comment on the Oil crisis 1973 and growth of energy sector in India.	(7)	CO1
b.	Classify the non-conventional energy resources, discuss them briefly. What are the advantages and limitations of renewable energy sources? Briefly discuss the environmental impacts of conventional energy usage.	(7)	CO1

5. **Answer any <u>one</u> of the following-**

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. **(7)** **CO2**

b. Explain the depletion process of solar radiation as it passes through the atmosphere to reach the surface of earth. Why orientation is needed in concentrating type collector. Describe system of sun tracking. **(7)** **CO2**

6. **Answer any <u>one</u> of the following-**

a. What is the sources of Tidal energy? What are the main hurdles in the development of Tidal energy?
The basin area of a Tidal power plant is 20 x 10^6 m^2. The tidal range is 8 m. Calculate the energy generated in kWh. **(7)** **CO3**

b. Write a short note on small head hydropower development. What type of turbine is best suited for micro hydel plant? Describe it. **(7)** **CO3**

7. **Answer any <u>one</u> of the following-**

a. Explain the process of commercial production of ethanol from biomass. Explain the desirable features of bio-ethanol that makes it suitable as automobile fuel. **(7)** **CO4**

b. Explain the importance of biomass programme in India. Compare the construction and performance of floating drum type and fixed dome type biogas plants with the help of neat sketches. **(7)** **CO4**

8. **Answer any <u>one</u> of the following-**

a. Explain the Basic Principal of operation for Integrating Non-Conventional Energy Resources to Conventional Sources. What are its limitations? What are the advantages of integration? **(7)** **CO5**

b. Give a brief description on types of wind turbines.
A HAWT having the rotor diameter as 80 m is rotating at 40 rpm. The wind speed is 20 m/s at 1 atm and 270°C. Calculate the torque produced at the shaft for maximum output of the turbine. **(7)** **CO5**