

**MATERIAL FOR RENEWABLE ENERGY APPLICATION
(REEN 5141)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Etching refers to the removal of material from
 - (a) the soft surface
 - (b) the hard surface
 - (c) the sticky surface
 - (d) the wafer surface
 - (ii) Anti-reflective coatings are applied to the surface of solar cell,
 - (a) to increase the temperature
 - (b) to increase the efficiency
 - (c) to minimize the absorptance
 - (d) None of these
 - (iii) Quantum dots can be used in
 - (a) Crystallography
 - (b) Optoelectronics
 - (c) Mechanics
 - (d) Quantum physics
 - (iv) Chemical solution deposition is also known as
 - (a) Sol-gel
 - (b) CVD
 - (c) Plasma spraying
 - (d) Laser pyrolysis.
 - (v) Full form of PECVD
 - (a) Plasma Enhanced Chemical vapour deposition
 - (b) Positive Energy Chemical Vapour Deposition
 - (c) Pressure enhanced Chemical Vapour Deposition
 - (d) None of these
 - (vi) Electron Microscope can give a magnification up to
 - (a) 400,000X
 - (b) 100,000X
 - (c) 15000X
 - (d) 100X
 - (vii) Industrial Silicon extraction process is
 - (a) Bridgman technique
 - (b) Czochralski technique
 - (c) Float zone technique
 - (d) None of these

- (viii) What are used to turn wind energy into electrical energy?
(a) Turbine (b) Generators
(c) Yaw motor (d) Blades
- (ix) Which of the following is used in electron microscope?
(a) Electron beams (b) Magnetic fields
(c) Light waves (d) Electron beams and magnetic fields
- (x) What type of energy is wind energy?
(a) Renewable energy (b) Non-renewable energy
(c) Conventional energy (d) Commercial energy.

Group - B

2. (a) Illustrate about the nano-material? Explain top down and bottom up approach towards the nano materials? [(CO1) (Remember/LOCQ)]
(b) Classify and explain the quantum dots & nanocrystals? [(CO2) (Understand/LOCQ)]
 $(2 + 3 + 3) + (2 + 2) = 12$
3. (a) Analyse the functional differences between CVD and PVD. Justify your arguments. [CO1, (Analyse/IOCQ)]
(b) Discuss about the Dry and wet Plasma Etching. [CO1, (Remember/ LOCQ)]
 $6 + (3 + 3) = 12$

Group - C

4. (a) Analyse the current - voltage characteristic and Fill Factor of solar cell. [CO3, (Analyse/IOCQ)]
(b) Why crystalline silicon solar cells are mostly used in Photovoltaic plant. [CO3, Understand/IOCQ]
 $6 + 6 = 12$
5. (a) Outline in details the working principle of solar cells with equivalent circuit and I-V curve. [(CO3) (Analyze/IOCQ)]
(b) Illustrate, the principle of operation of Tandem solar cell consists of III-V compound materials.
 $6 + 6 = 12$

Group - D

6. (a) Analyse the probable reasons for blade damage in a wind turbine with their degree of impact in terms of severity? [CO4, (Analyze/IOCQ)]
(b) Reflect on the necessities of the effective measures can be taken to prevent those damages? Discuss the impact of Near Far Effect. [CO4, (Analyze/IOCQ)]
 $6 + 6 = 12$

7. (a) Create a computational testing model for checking degradation in blade materials. [CO4, (Create/ HOCQ)]
 (b) Evaluate the efficacy of the recycling process of the wind turbine thrashes and materials. [CO4, (Evaluate/ HOCQ)]
- 8 + (2 + 2) = 12**

Group - E

8. (a) A single solar cell(10cmX10cm) produces a voltage of 0.5V and current up-to 2.5A. if the solar insolation is 800W/m, what would be the efficiency of the solar cell? [CO3, (Evaluate/ HOCQ)]
 (b) Reflect on the need of electron beams and magnetic fields for being used in electron microscope? Analyse the same with relevance of CRT. [CO3, Analyse/IOCQ]
- 6 + (2 + 4) = 12**
9. (a) Draw and explain the silicon crystal structure. [(CO1) (Understand/LOCQ)]
 (b) Why electron beams and magnetic fields are used in electron microscope? Explain with relevance of CRT. [(CO5) (Understand/LOCQ)]
- 6 + (2 + 4) = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	23.96%	50.12%	25.92%

Course outcomes (CO):

1. To get familiarized with the properties of different materials- metals and nonmetals.
2. To learn about the manufacturing process of nano-material and its characterizations techniques.
3. Ability to design photovoltaic material and its electronic properties for the solar energy application.
4. Ability to understand the role of selection for the wind turbine material and it required properties.
5. To acquire knowledge on the characterization of materials by modern tools.

Department & Section	Submission Link
RE	https://classroom.google.com/c/NDUwNjI5NTI3OTk5/a/NDc1MTYwNTc4OTY4/details