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) Quantum dots can be used in
(a) Crystallography (b) Optoelectronics
(c) Mechanics (d) Quantum physics

(ii) How much wind power generation facility India has presently?
(a) 20,000 MW (b) 12,000 MW
(c) 140,000 MW (d) 5000 MW

(iii) CVD stands for
(a) Carbon vapour density (b) Chemical vapour density
(c) Chemical vapour deposition (d) Carbon vapour deposition

(iv) Etching refers to the removal of material from
(a) the soft surface (b) the hard surface
(c) the sticky surface (d) the wafer surface

(v) Most popular Silicon extraction process is
(a) Bridgman technique (b) Czochralski technique
(c) Float zone technique (d) None of these

(vi) What is the main source for the formation of wind?
(a) Uneven land (b) Sun
(c) Vegetation (d) Seasons

(vii) Most efficient solar cells are
(a) Dye-sensitized solar cell (b) Amorphous silicon solar cell
(c) Mono-crystalline solar cell (d) Polycrystalline solar cell

(viii) Which of the following is used in electron microscope?
(a) electron beams (b) magnetic fields
(c) electron beams and magnetic fields (d) light waves

(ix) What are used to turn wind energy into electrical energy?
(a) Turbine (b) Generators
(c) Yaw motor (d) Blades

(x) Which among the following helps us in getting a three-dimensional picture of the specimen?
(a) Transmission Electron Microscope (b) Scanning Electron Microscope
(c) Compound Microscope (d) Simple Microscope

Group – B

2. (a) What is nanomaterial? Define top down and bottom up approach towards the synthesis of nano materials?

(b) What do you mean by quantum dots & nanocrystals?

(2 + 3 + 3) + (2 + 2) = 12

3. (a) Name various physical vapour deposition techniques. Why is vacuum necessary during physical vapour deposition of metals?

(b) Discuss about the Dry and wet Plasma Etching**.**

(3 + 3) + (3 + 3) = 12

Group – C

4. (a) Explain in details the working principle of solar cells with equivalent circuit and I-V curve.

(b) Explain in brief, the principle of operation of Tandem solar cell consisting of III-V compound materials.

6 + 6 = 12

5. (a) What are the advantages and disadvantages of Photovoltaic solar energy conversion?

(b) Discuss the effect of series resistance R_s, Shunt Resistance R_{sh} and minority carrier life time on the performance of the solar cell.

(3 + 3) + 6 = 12

Group – D

6. (a) Draw and explain different parts of a blade of a wind turbine. What is poisson's ratio?

(b) Discuss in detail about the probable reasons for blade damage.

(2 + 3 + 1) + 6 = 12

7. (a) What are the composites used for the wind turbine blades normally? Discuss Glass and Carbon Fibers, Aramid &Basalt fibers.

   (b) Name two elements that are used as Matrices in wind blade composites. What are nano engineered polymers and composites?

(2 + 6) + (2 + 2) = 12

Group – E

8. (a) What is material characterization? Explain the mechanism of SEM with its relative advantages.

   (b) Define series and shunt resistance for a PV cell. What is PLD?

6 + (2 + 4) = 12

9. Write short notes on any four out of the following: **(3 × 4) = 12**
   (i) Universal Testing Machine
   (ii) Utility of Carbon Fibers
   (iii) CRT
   (iv) Grapheme
   (v) Future of Renewable Energy in India.

Department & Section	Submission Link
RE	https://classroom.google.com/w/MjE5MjczNjczODE5/tc/Mjg2MjgzMjUxNzMw/details