WASTE MANAGEMENT WITH RENEWABLE ENERGY SYSTEMS
(REEN 5246)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable. A mm graph paper will be supplied.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) The first Environment Act of India was passed in
(a) 1974 (b) 1980 (c) 1976 (d) 1990

(ii) Identify the parameter which need not be considered in EIA report
(a) Air quality (b) Water quality
(c) Religious belief of community (d) Flora & fauna

(iii) Identify the equipment which is not used in conventional power plants?
(a) ESP (b) Baghouse
(c) Pyranometer (d) High Volume Sampler.

(iv) The incineration methodology of Solid Waste Management in India may have the chance of
(a) Air pollution (b) Water pollution
(c) Leachate (d) Aerobic Composting

(v) H319 Silicon wafer causes
(a) serious eye irritation (b) brain damage
(c) no detrimental effects (d) respiratory problem

(vi) Identify a problem associated with Sanitary Landfill
(a) Air Pollution (b) Infestation of rodents
(c) Leachate (d) Fire hazard

(vii) The temperature difference in the oceans between the deep and shallow parts in the tropics is of the order
(a) 5˚ C to 10˚ C (b) 20˚ C to 25˚ C
(c) 40˚ C to 45˚ C (d) None of these

(viii) The waste management in Lagoons by Root-zone/Reed Bed treatment uses
(a) Neem (b) Zoo Plankton
(c) Babul (d) Typha elephantiana

(ix) The RSPM sampler measures
(a) Particulate size more than 50 micron
(b) Particulate size more than 100 micron
(c) Particulate size of 10 micron or less
(d) Particulate size more than 10 micron but less than 30 micron

(x) Rotating Biological Disk Contactor is
(a) an attached growth system (b) a suspended growth system
(c) an anaerobic system (d) synonymous with venturi scrubber.

Fill in the blanks with the correct word

(xi) The country organized Global Celebration of World Environment Day 2023 was _____.

(xii) In Rainwater Harvesting a suitable method is ground _____.

(xiii) In India the Environment Protection Act was passed in _____.

(xiv) The Monod model for bioremediation kinetics is applicable for_____ solution.

(xv) The objective of OTEC is basically to generate _____.

Group - B

2. (a) A factory uses 2,00,000 litres of furnace oil (specific density 0.97) per month. If for one million litres of oil used per year, the particulate matter emitted is 3.0 tonnes per year, SO_2 emitted is 59.7 tonnes per year, NO_X emitted is 7.5 tonnes per year, hydrocarbons emitted are 0.37 tonnes per year, and carbon monoxide is 0.52 tonnes per year, calculate the height of the chimney required to be provided for safe dispersion of the pollutants. *[(CO2)(Evaluate/HOCQ)]*

(b) In order to reduce Carbon Foot Print eat less meat and more plants – Explain. *[(CO2)(Apply/IOCQ)]*

8 + 4 = 12

3. (a) Discuss the categories of industries as per our state pollution control board. Indicate the particular category in which renewable industries belong. *[(CO2)(Analyse/IOCQ)]*

(b) End-of-life recycling is also a source of hazardous chemical exposures for workers – Analyze critically. *[(CO3)(Remember/LOCQ)]*

(c) Calculate the Ambient SPM concentration from the field data obtained in a High Volume sampler:
Average pressure of the day at station level = 712.59 mm of Hg
Average temperature= 30.6C; sampling rate= clean filter: 1.6 Cu m/min
Filter after exposure = 1.4 cu. m/min;
Tare weight of filter before exposure= 3.417 g
Tare weight of filter after exposure = 4.025 g
N. B. 1) Sampling time is round the clock; 2) Assume Air as ideal gas.
[(CO3)(Evaluate/HOCQ)]

(3 + 1) + 2 + 6 = 12

Group - C

4. (a) Discuss briefly the Principle and Operation of a solid waste Compactor used in Corporation and Municipalities with a representative sketch. *[(CO3)(Analyse/HOCQ)]*
   (b) Enumerate the two biological treatment processes of municipal solid waste. *[(CO3)(Remember/LOCQ)]*
   (c) What are the components of Proximate Analysis? Why proximate analysis is required in solid waste management? *[(CO3)(Remember/LOCQ)]*

5 + 3 + (2 + 2) = 12

5. (a) Discuss briefly the basic principle of Wastewater Treatment using photo-catalysis. *[(CO4)(Analyse/IOCQ)]*
   (b) List out two methods of recycling old solar panels. *[(CO4)(Remember/LOCQ)]*
   (c) Delineate how various precious metals can be obtained from E-waste. *[(CO4)(Remember/LOCQ)]*

4 + 2 + 6 = 12

Group - D

6. (a) Analyze the Hazardous aspects associated with installation of a Wind Mill. *[(CO3)(Analyse/IOCQ)]*
   (b) Write a brief note on LED Lamps Recycling Technology towards a Circular Economy. *[(CO3)(Evaluate/HOCQ)]*
   (c) List out two main applications of geothermal energy. *[(CO3)(Remember/LOCQ)]*

6 + 4 + 2 = 12

7. (a) Discuss the methodology of Rapid Environmental Impact Assessment for renewable energy industries. *[(CO4)(Analyze/IOCQ)]*
   (b) Enumerate the salient steps for conducting EIA in a nuclear power plant. *[(CO4)(Remember/LOCQ)]*

6 + 6 = 12

Group - E

8. An industrial wastewater flow of 10,000 m3/day is aerated in a two-celled facultative type aerated lagoon operated in series and having 5 days detention time in each cell of depth 3.3 m. The temperature of inflow is 55^0C and ambient temperature is 10^0C. Assume f=0.49/day.
   (i) Draw a schematic diagram and Estimate the temperature in the first cell. *[(CO3)(Evaluate/HOCQ)]*
   (ii) Also estimate the temperature in the second cell. *[(CO3)(Evaluate/HOCQ)]*

(3 + 5) + 4 = 12

9. (a) Discuss various hazards associated with CFL. *[(CO3)(Analyse/IOCQ)]*
   (b) Show how it is modified using LED lights. *[(CO3)(Analyze/IOCQ)]*
   (c) What is solar passive architecture? *[(CO3)(Remember/LOCQ)]*

4 + 6 + 2 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.12	35.42	36.46

Course Outcome (CO):

After the completion of the course students will be able to

1. To identify the need for Waste Management Principles in Renewable Energy Systems.
2. To analyze different technologies and Legislations/Rules associated with the subject.
3. To identify new indigenous technologies and their utilization.
4. To implement Do's & Don'ts practices for Waste Management in Renewable Energy Endeavors.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*