NON CONVENTIONAL ENERGY SOURCES
(AEIE 3132)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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)   Tidal power is directly proportional to
           (a) square root of tidal range   (b) square of tidal range
           (c) logarithm of tidal range   (d) proportional to the tidal range

    (ii)   A two-blade wind turbine produces maximum power when the tip-speed ratio is equal to
           (a) Π   (b) 2Π   (c) 3Π   (d) 0·593

    (iii) Ocean wave energy can be effectively stored as
           (a) Hydrogen energy   (b) Electrical energy
           (c) Thermal energy   (d) Mechanical energy

    (iv)   Difference between updraft and down draft process is by the position of process like
           (a) drying   (b) pyrolysis
           (c) reduction   (d) oxidation

    (v)   A pyranometer is an instrument that measures
           (a) Diffuse solar radiation   (b) Scattered solar radiation
           (c) Direct Beam solar radiation   (d) Total solar radiation

    (vi)   Double basin arrangement is a class of
           (a) solar pond power plant   (b) biogas power plant
           (c) large wind power generator   (d) tidal power plant

    (vii) PV module formed by number of solar cells connected in
           (a) series   (b) parallel
           (c) star   (d) series -parallel

    (viii) Which one to be acted as best working fluid in OTEC?
           (a) ammonia   (b) alcohol
           (c) water plus ammonia   (d) none of these

(ix)   What is the number of solar module to be connected to generate 24V, 95A with the specification of a single module 12V, 5A?
(a) 18   (b) 28   (c) 38   (d) 48

(x)   Tidal power is directly proportional to
(a) square root of tidal range   (b) square of tidal range
(c) logarithm of tidal range   (d) proportional to the tidal range

Group- B

2.   (a)   Analyze different component present in crude oil.How they are separated? [(CO1) (Analyze/IOCQ)]

   (b)   What do you mean by fracking in crude oil extraction? [(CO1)(Understand/LOCQ)]

   (c)   Design a hybrid systemforBiomass based electricity generation.
[(CO2) (Create/HOCQ)]
(2 + 4) + 2 + 4 = 12

3.   (a)   Evaluate the angle of incident for air mass ratio of 1.5. What will be the solar constant value at this angle?   [(CO2) (Evaluate/HOCQ)]

   (b)   What is the purpose of flue gas desulfurization (FGD) in any production industries?   [(CO4) (Understand/LOCQ)]

   (c)   Analyze the importance of the hybrid system in the non-conventional sources based electricity generation.   [(CO2)(Analyse/IOCQ)]
(2 + 1) + 3 + 6 = 12

Group - C

4.   (a)   "Sunshine is free but solar energy is not".Analyze the statement.
[(CO6)(Analyze/IOCQ)]

   (b)   Analyze the need of MPPT in the generation of electricity for semiconductor based solar cell.   [(CO3) (Analyze/IOCQ)]

   (c)   Design the water heating system with solar collector. [(CO3) (Evaluate/HOCQ)]
4 + 4 + 4 = 12

5.   (a)   Design with the help of a basic general block diagram of electricity generation using PV cell module and explain the function of each block.
[(CO3) (Design/HOCQ)]

   (b)   Define slop angle, surface azimuth, and angle of incidence for the collector surface.   [(CO2) (Understand/LOCQ)]

   (c)   Given that germanium has a band gap of 0.67 eV, what is the minimum wavelength will be absorbed by the solar cell.   [(CO2)(Evaluate/HOCQ)]
(4 + 2) + 3 + 3 = 12

Group - D

6. (a) What do you understood by pitch angle and Ekman layer?
   [(CO5) (Remember/LOCQ)]

   (b) Analyze three numbers of site selection criterion to installed Wind Energy Extraction System on the offshore. [(CO6)(Analyze/IOCQ)]

   (c) Comparative analysis between updraft and downdraft type gasifier.
   [(CO3)(Analyze/IOCQ)]
   (2 + 2) + 4 + 4 = 12

7. (a) Graphically and mathematically analyze maximum output power from a wind turbine with different numbers of blades are connected. Find its value.
   [(CO5) (Analyze/IOCQ)]

   (b) Draw the basic block diagram of a biodiesel production process.
   [(CO3) (Remember/LOCQ)]

   (c) Evaluate the maximum power output of a turbine if wind speed 8m/s, air density 1.2 kg/m^3 and rotor Diameter 60m. [(CO5)(Evaluate/HOCQ)]
   (4 + 2) + 3 + 3 = 12

Group - E

8. (a) Derive an expression of the tidal range power. [(CO3) (Remember/LOCQ)]

   (b) Analyze the different modes of operation of the tidal power plant.
   [(CO3)(Analyze/IOCQ)]

   (c) A tidal power plant has reservoir of area $50*10^6$m^2. The tide has the range of 10m. The turbine can be operational with a head of 3m. The turbine generator has efficiency of 80%. Evaluate the total power in one filling and employing cycle. [(CO4)(Evaluate/HOCQ)]
   4 + 4 + 4 = 12

9. (a) Comparative analysis between single flash steam in liquid dominated high temperature plant and hard dry rock binary fluid system (block diagram must).
   [(CO3)(Analyse/IOCQ)]

   (b) What are the environmental problems caused by geothermal energy? [(CO4) (Understand/LOCQ)]

   (c) Evaluate the efficiency, if the upper layer and at 1000m layer of the ocean temperature of ocean are 27°C and 7°C respectively.[(CO3)(Evaluate/HOCQ)]
   (4 + 4) + 2 + 2= 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	21.88%	47.92%	30.20%

Course Outcome (CO):

After the completion of the course students will be able to

1. Understand the issue of fuel availability; analyze the supply and demand of fuel in the world.
2. Identify the different sources of renewable energy and innovative technologies in harnessing energy from renewable sources.
3. Explain production of electricity from clean resources.
4. Study the environmental impacts of a power plant with various resources.
5. Apply the wind energy for human usage.
6. Learn the conception of the economical use of renewable energy resources over conventional energy sources.

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

Department & Section	Submission Link
AEIE	https://classroom.google.com/c/NDA1MTgxMzc3Njg2/a/NDY0MTk5MDUxNTQ3/details