B.TECH/AEIE/5TH SEM/ AEIE 3132/2020

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 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) If a hydrocarbon molecule has 30 carbons, what form would it most likely be?
(a) solid (b) liquid (c) gas (d) others.

(ii) The maximum value of the tip speed ratio for the lift force type arrangement of WECS will be
(a) 10 (b) 1 (c) 5 (d) None.

(iii) What is the temperature in the outer layer of outer core of the earth?
(a) 6000K (b) 3000K (c) 4000K (d) 5000K.

(iv) Output of a wind turbine varies on air velocity
(a) exponentially (b) logarithmically
(c) linearly (d) cubically.

(v) In case of OTEC, the gross mechanical power is proportional to the
(a) $(\Delta T)^3$ (b) $(\Delta T)^2$ (c) (ΔT) (d) $(\Delta T)^5$

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

(vii) 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.

(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) 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.

(x) The maximum efficiency of a silicon solar cell is achieved when the cell is fabricated from
(a) Mono-crystal Si (b) Polycrystal Si
(c) Amorphous Si (d) any other Si.

Group – B

2. (a) Comparison between conventional and non conventional sources.
Draw the basic block diagram of a hybrid system consist of biomass and PV cell as a resource.

(b) Why energy audit is important? What are the different types of energy audit phase?

(3 + 4) + (2 + 3) = 12

3. (a) As per the temperature gradient of a distillation column, what are the components available from the crude oil?

(b) Draw the basic block diagram of a nuclear power plant.

(c) Discuss the environmental effects due to oil and natural gases.

5 + 4 + 3 = 12

Group – C

4. (a) Derive an expression of maximum efficiency of a solar cell. Define fill factor.

(b) What is a solar PV module? What are the different materials used for fabrication of solar cells.

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

5. (a) Discuss solar spectrum and Air mass ratio. What are the advantages and disadvantages of pyranometer?

(b) Describe solar water distillation system with proper sketch.

(2 + 2 + 3) + 5 = 12

Group – D

6. (a) Derive an expression of maximum output power from a wind turbine. Find its value at Betz condition?

(b) What factors are taken onto consideration in site selection for wind power generation?

(6 + 2) + 4 = 12

7. (a) Discuss operating characteristics of the wind mill.
A wind energy generator generates 2000 watts at a rated speed of 24 kph at the atmospheric pressure and temperature 20°C. Calculate the change in output if

the wind generator is operated at a altitude of 2000m at temperature 10°C, wind speed 35kph and air pressure 0.88 atmosphere

(b) Explain updraft and downdraft gasifier with proper block diagram.

(3 + 4) + 5 = 12

Group – E

8. (a) What do you understand by spring and neap tides? Derive an expression of power generated by tidal current/stream power.

(b) What are the advantages and disadvantages of wave energy?

(4 + 5) + 3 = 12

9. (a) What are the main types of ocean thermal energy conversion (OTEC) power plants? Explain any one.

(b) What are the environmental impacts due to construction of OTEC? Draw the basic block diagram of dry steam power plant based on geothermal as a resource.

(2 + 4) + (2 + 4) = 12

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AEIE	https://classroom.google.com/c/MjQxNjI0NDgxMjE3/a/MjcxMDQxNTcxOTYw/details