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SARDAR PATEL UNIVERSITY

M.Sc. Renewable Energy Examination (Semester –II)

Thursday, 07-04-2016, Time: 10.30 to 0.1.30P.M

PS02CREN02: Ocean Energy and Tidal Energy

Total Marks: 70

Q-1 Select most appropriate answer **(8x1 =8)**

1.Ocean thermal energy plants can operate if the temperature difference between the water at the surface and water at depths up to ----------km is ----------or more

a) 2km and 293K
b) 10km and 293k
c) 5km and 20°C
d) 10km and 20°C

2. The temperature difference between the upper layers and the deeper layers of the ocean should be _____ to install an OTEC power plant.

a) 40°C
b) 50°C
c) 20°C
d) 30°C

3. Floating generators are used in the sea to harness _____.

a) tidal energy
b) wave energy
c) hydel energy
d) energy from OTEC power plant

4. A high tide occurs _____.

a) on every new moon day
b) on every full moon day
c) both on new moon and full moon day
d) any time

5. Ocean thermal energy is due to

a) Energy stored by waves in the ocean
b) Temperature difference at different levels in the ocean
c) Pressure difference at different levels in the ocean
d) Tides arising out in the ocean

6. The total energy per unit width per unit length of a gravity wave in deep water over a complete wavelength is given by

a) $\frac{1}{2}\rho g\lambda^2$
b) $\frac{1}{2}\rho g a^2$
c) $\rho g a$
d) $\frac{1}{4}\rho g a^2$

7.The power per metre width in a typical ocean wave is of order

a) 1 kW m-1
b) 10 kW m-1
c) 50 kW m-1
d) 100 kW m-1

8.The interval between high tides is about

a) 6 hours.
b) 9.5 hours.
c) 12 hours
d) 12.5 hours

Q-2 Answer **any seven** questions (7x2 =14)

1. What is ocean energy?
2. Define the principle of OTEC plant, ocean surface & deep water temperature
3. What is the maximum power that may be produced from an OTEC cycle when the upper & lower layer temperature is 34°C and 6°C respectively. The cycle receives 180 kW of heat. How much heat is rejected from the cycle?
4. Enlist the main deciding criteria for location of ocean wave plants.
5. Calculate the wave length and wave velocity for the progressive ocean wave with period 6 second.
6. List out the limitation of ocean wave energy conversion technology.
7. What is point absorber wave machine?
8. What is tidal current?
9. The basin area of tidal power plant is 20x106 m^2. The tidal range is 8m, calculate the energy generated in Kwh.

Q-3 A) State various forms of ocean energy source and its merits and demerits (06)

Q-3 B) Describe the off-shore and on-shore ocean energy conversion technologies (06)

OR

Q-3 B) Describe in detailed about power transmission technology from off-shore ocean to land based centers. (06)

Q-4 A) Explain construction and working principle of open cycle OTEC system with neat sketch diagram. (06)

Q-4 B) Drive an expression for Carnot efficiency of an OTEC plant with the help of T-S diagram. (06)

OR

Q-4 B) Describe closed cycle OTEC system and state why closed cycle OTEC is preferred? (06)

Q-5 A) Drive an expression for energy and power in ocean waves. (06)

Q-5 B) Calculate wave energy and power. Ocean waves on the coast of Tamilnadu, India were with following data. Amplitude 1 m, Period 6s. Calculate the following: wavelength, velocity, energy density, power extracted from a wave of 10 m with a power density, energy in 100 m wide wave. Assume density of ocean water as 1000 kg/m^3 (06)

OR

Q-5 B) Give the classification of wave power extraction methods based on operating principle and structure with neat diagram (06)

Q-6 A) Explain the various methods of tidal power generation with neat sketch diagram. Enlist the limitations of each method? (06)

Q-6 B) A tidal power plant of single basin type has a basin area of 25 x 10^6 m^2. The tide has a range of 10 m. The turbine however, stops operating when the head on it falls below 2 m. Calculate the energy generated in one filling process, in kWh if the turbine generator efficiency is 75 %. Take density of sea water is 1025 kg/m^3.

OR

Q-6 B) State the present status of tidal power plants in India and around the world. Why the tidal energy not being utilized fully? (06)

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