

Q.1. Answer  $\Rightarrow$

Explain the basic principle of the OTEC.  
Also explain the open OTEC cycle.

\* Principle of the OTEC  $\Rightarrow$

$\hookrightarrow$  The principle of ocean thermal energy conversion (OTEC) is that there is a temperature difference between water at the bottom of the sea and the water at the top.

$\hookrightarrow$  This temperature difference can be used to operate a heat engine and most of the radiation is being absorbed at the surface layer of water.

$\hookrightarrow$  Therefore, it is essential to connect the reversible heat engine between source and cold sink to produce work that can be converted into required applications.

$\hookrightarrow$  The absorption of solar radiation in the water varies and can be expressed by Lambert's law  $\Rightarrow$

$$\frac{dI_y}{dy} = -\mu I$$

or  $I_y = I e^{-\mu y}$   
where,

$I_y$  = Radiation Intensity at depth  $y$  from water surface and falls exponentially with depth.

$I$  = Radiation intensity at water surface  
 $\mu$  = Extinction or absorption coefficient.

### \* Types of OTEC System $\Rightarrow$

There are following types of OTEC system

1. Open cycle
2. Closed cycle
3. Hybrid cycle

## \* Open OTEC cycle system $\Rightarrow$

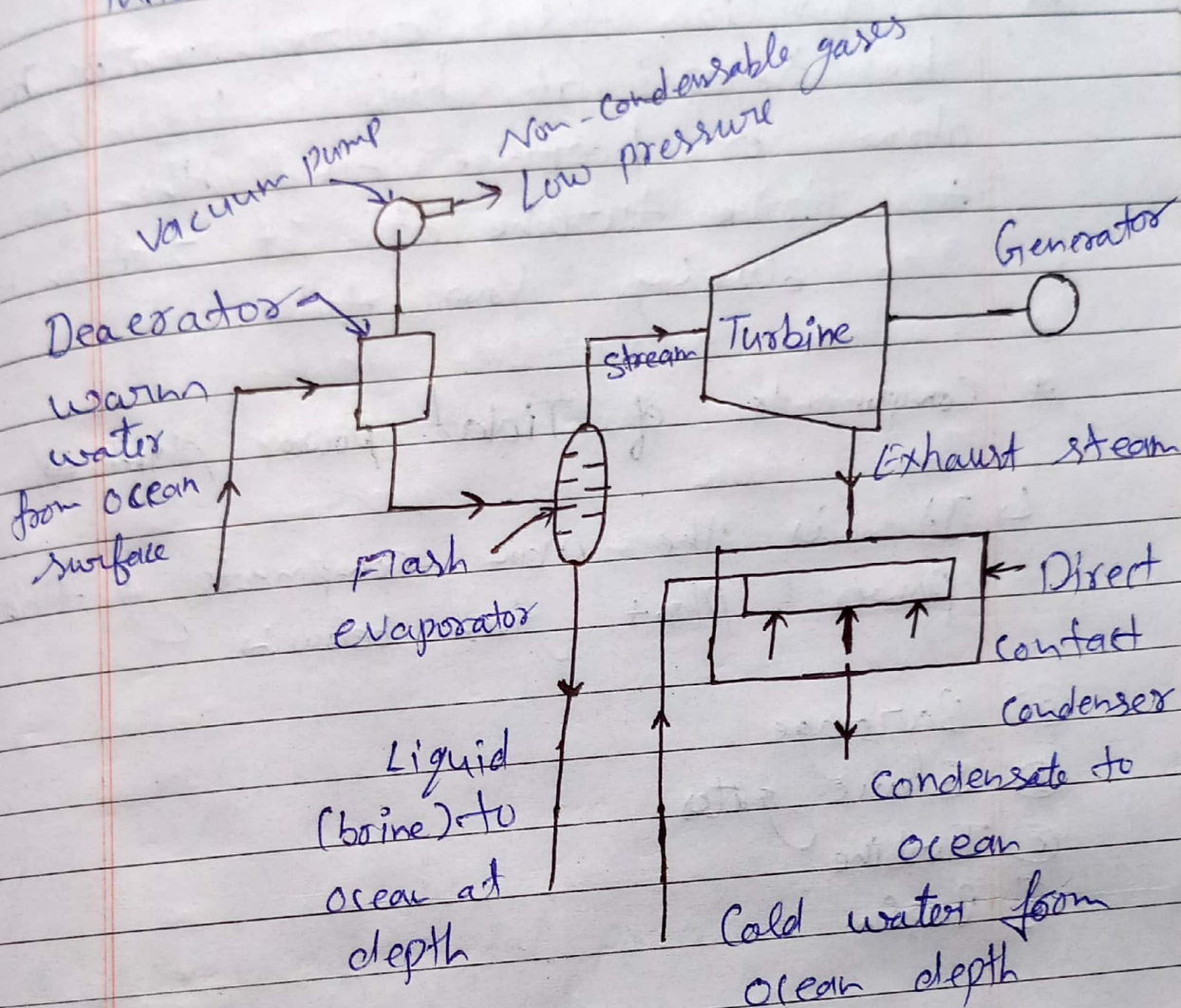
$\hookrightarrow$  In this system, the warm water from ocean surface is admitted through the deaerator to the flash evaporator which is maintained under high vacuum.

$\hookrightarrow$  In the OTEC cycle system, the deaerator also removes the dissolved non-condensable gases from water before supplied to the evaporator.

$\hookrightarrow$  This low pressure steam every very high specific volume is supplied to turbine where it expands and the mechanical power so developed is converted into electrical power by the generator.

$\hookrightarrow$  The exhaust steam from turbine is discharged into a direct contact type heat exchanger and mixes with the cold water drawn from ocean at a depth of about 1 to 2 km.

↳ The mixture of condensed steam and ocean cold water are discharged into the ocean.



[fig → open OTEC cycle]