

## Centre for Energy Studies

### ESL-850 Solar Refrigeration & Air conditioning Minor - II

Time : 1 hr.

M.M. : 26

Attempt all questions

1. Draw Schematic diagrams of the followings: (3x5=15)
  - i) Single and dual fluid Rankine cycle solar cooling systems
  - ii) Fuel Assisted Rankine cycle cooling system
  - iii) Fuel Assisted steam regenerative Brayton Cycle Cooling System
  - iv) Gas cycle Solar Refrigeration System, and
  - v) State GWP, ODP, GDP terms
2. Drive an expression for COP of a steam jet ejector cooling system and discuss the effect of various operating parameters. (6)
3. In an industrial plant, a steam jet ejector refrigeration plan is installed to supply cooled water at  $10^{\circ}\text{C}$ . The temperature of makeup water and re-circulated water is  $25^{\circ}\text{C}$ . Motive steam is supplied to the ejector at pressure  $8.5 \text{ kgf/cm}^2$  and temperature of  $190^{\circ}\text{C}$ . The water vapor leaving the flash chamber and entering the ejector has dryness fraction of 0.95. The condenser pressure is 6.0 cm of  $\text{Hg}$ . Assuming

Nozzle Efficiency = .92, Entrainment efficiency = 0.65, Diffuser efficiency = 0.75.

Determine the mass of motive steam per kg of water vapor and per TR of refrigeration. Also show that COP of the system is nearly 0.53. Use of steam Table is desirable. (5)

or

- a) What is cascaded/VCR Refrigeration? Explain why its cop is higher than single stage VCR and how the optimum coupling temperature is determined? (3)
- b) Show that 1% evaporation of water can reduce the remaining water temp. by 5.5. C. (2)

cop / P<sub>2</sub>