Section C [20 marks x 2 = 40]

Q.10) (CO3) Explain in detail the standard procedures for the testing of solar thermal storage devices.

Q.11) (CO2) A cylindrical parabolic focussing collector is used for heating a thermic fluid (Cp = 2.2 kJ/kg-K) which enters with a temperature of 160°C. The concentrator has an aperture of 1.6 m and a length of 2.8 m. The absorber tube has an inner diameter of 2.8 cm and outer diameter of 3.2 cm and has a concentric glass cover around it.

Given that: Specular reflectivity of concentrator surface: 0.82
Intercept factor: 0.91
$(\alpha\tau)_b$: 0.8
Beam radiation incident normally on aperture plane: 550 W/m^2
Diffuse radiation incident on aperture plane: 150 W/m^2
Overall loss coefficient: 9.5 W/m^2-K
Convective heat transfer coefficient on inside of absorber tube: 325 W/m^2-K
Ambient temperature: 27°C
Mass flow rate of fluid: 360 kg/h

Calculate the useful heat gain rate, the exit temperature of the fluid and the instantaneous efficiency.

OR

Q.11) (CO2) Estimate the collector area required for a 80 MW line focusing solar thermal power plant producing electricity for 8 hours every day. The collector is operating at a temperature of 400°C.

Make following assumptions:
1..The Rankine cycle has an efficiency of 0.36.
2.The electrical generator efficiency is 0.96.
3.The solar insolation during a typical day is 6 kWh/m^2.

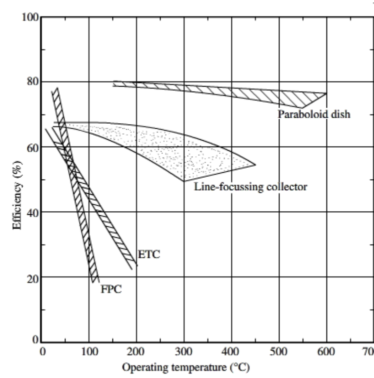

Fig. 2.6 *Efficiency of various types of collectors as a function of operating temperature (Adapted from Gehlisch et al. [1] and Rabl [2])*