33 cells in series $\Rightarrow$ Per cell: $I_{SC}^* = 3$ A, $V_{OC}^* = 0.6$ V and $P_M^* = 1.35$ W
Assuming m = 1; $V_t(\text{V}) = 0.025 \times (273 + 25)/300 = 0.0248\ V \Rightarrow v_{OC} = 0.6/0.0248 = 24.19 > 15$
Then, $FF_0 = (24.19 - \ln(24.91))/25.19 = 0.833$; $FF = 1.35/(0.6 \times 3) = 0.75$
And $r_s = 1 - 0.75/0.833 = 0.0996 < 0.4 \Rightarrow R_S = 0.0996 \times 0.6/3 = 19.93\ \text{m}\Omega$

$$a = 20.371; b = 0.953 \Rightarrow V_M/V_{OC} = 0.787 \text{ and } I_M/I_{SC} = 0.943$$

It is worth noting that these values lead to a value of $FF = 0.742$, slightly different from the starting value. This error shows the precision available by the method, better than 1% in this instance. Sometimes values of $m = 1.2$ or 1.3 give a better approximation.

2. Determination of the temperature of the cells under the considered operating conditions (equations 20.70 and 20.71):

$$C_t = 23/800 = 0.0287^\circ\text{C m}^2/\text{W} \Rightarrow T_c = 34 + 0.0287 \times 700 = 54.12^\circ\text{C}$$

3. Determination of the characteristic parameters of the cells under the operating conditions being considered (equations 20.68 and 20.69):

$$I_{SC}(700\ \text{W/m}^2) = 3 \times (700/1000) = 2.1\ \text{A}$$

$$V_{OC}(54.12^\circ\text{C}) = 0.6 - 0.0023 \times (54.12 - 25) = 0.533\ \text{V}$$

With R_S considered constant, these values lead to:

$$V_t = 27.26\ \text{mV}; v_{OC} = 19.55; r_s = 0.0785; FF_0 = 0.805; FF = 0.742; P_M = 0.83\ \text{W}$$

4. Determination of the characteristic curve of the generator, (I_G, V_G):
Number of cells in series 330; Number of cells in parallel: 4. Then:
$I_{SCG} = 4 \times 2.1$ A $= 8.4$ A; $V_{OCG} = 330 \times 0.533$ V $= 175.89$ V; $R_{SG} = 1.644\ \Omega$; $P_{MG}^* = 1095.6$ W

$$I_G(A) = 8.4\left[1 - \exp\frac{V_G(V) - 175.89 + 1.644 \cdot I_G(A)}{9.00}\right]$$

To calculate the value of the current corresponding to a given voltage, we may solve this equation iteratively, substituting I_G for 0.9 I_{SCG} on the first step. Only one iteration is required for $V_G \leq 0.8\ V_{OCG}$. By way of example, the reader is encouraged to do it for $V_G = 140$ V and $V_G = 150$ V. The solution is $I_G(140\ \text{V}) = 7.77$ A and $I_G(150\ \text{V}) = 6.77$ A.

5. Determination of the maximum power point:

$$a = 17.48; b = 0.9458; V_M/V_{OC} = 0.7883; I_M/I_{SC} = 0.9332$$

$$V_M = 138.65\ \text{V}; I_M = 7.84\ \text{A}, P_M = 1087\ \text{W}.$$

Note that the ratio $P_M/P_M^* = 0.661$, while the ratio $G_{\text{eff}}/G^* = 0.7$. This indicates a decrease in efficiency at the new conditions compared to STC, primarily due to the greater solar cell temperature, $T_c < T_c^*$. An efficiency temperature coefficient can now be