EE 585 (Power System Operation and Control)

Quiz 3 Solution

الاسم:

A power system consists of two plants having the following fuel-costs:

$$FC_1 = 30 + 18P_1 + 0.035P_1^2$$

$$FC_2 = 32 + 22P_2 + 0.025P_2^2$$

The total power losses in the system is given by:

$$P_{Loss} = 5 \times 10^{-5}(P_1^2 + P_2^2) \quad \text{MW}$$

Assume P_1 = 500 MW, and P_2 = 600 MW.

i. Determine P_T in this case.

$$P_T = 500 + 600 - 5 \times 10^{-5}(500^2 + 600^2) = 1100 - 30.5 = 1069.5 \,\text{MW}$$

ii. Check whether these values of P_1 and P_2 satisfy the economical operation condition?

$$IFC_1 = 18 + 0.07P_1 = 18 + 0.07 \times 500 = 53$$
$$IFC_2 = 22 + 0.05P_2 = 22 + 0.05 \times 600 = 52$$
$$L_1 = \frac{1}{1 - 10^{-4}(500)} = 1.05263$$
$$L_2 = \frac{1}{1 - 10^{-4}(600)} = 1.06383$$

$$IFC_1 \times L_1 \neq IFC_2 \times L_2$$

Therefore, this is not economical operation.