EE 341 – ENERGY CONVERSION

The Ohio State University
Department of Electrical Engineering

EE 341

Energy Conversion
Home work Set # 4

Print Your Name

The Last Four Digits of Your OSU I.D. number :
1. (2-18, page 138) Three 25-kVA 24,000/277-V distribution transformers are connected in ∆-Y. The open-circuit test was performed on the low-voltage side of this transformer bank, and the following data were recorded:

\[ V_{\text{line,OC}} = 480 \text{ V} \quad I_{\text{line,OC}} = 4.10 \text{ A} \quad P_{3\phi,OC} = 945 \text{ W} \]

The short-circuit test was performed on the high-voltage side of this transformer bank, and the following data were recorded:

\[ V_{\text{line,SC}} = 1400 \text{ V} \quad I_{\text{line,SC}} = 1.80 \text{ A} \quad P_{3\phi,SC} = 912 \text{ W} \]

(a) Find the per-unit equivalent circuit of this transformer bank.
(b) Find the voltage regulation of this transformer bank at the rated load and 0.90 PF lagging.
(c) What is the transformer bank’s efficiency under these conditions?

2. The following figure shows a power system consisting of a three-phase 480-V 60-Hz generator supplying a load through a transmission line with a pair of transformers at either end.

\[ Z_L = 1.5 + j \ 10 \Omega \]

\[ Z_{\text{Load}} = 0.5 \angle 36.87^\circ \Omega \quad \text{(Y-connected)} \]

(a) Sketch the per-phase equivalent circuit of this power system.
(b) Find the active power P, reactive power Q, and apparent (complex) power S supplied by the generator. What is the power factor of the generator?