

Tutorial-1

[Due date: 21/01/2026, 11am]

A 2200-V, 1000-kVA, 50-Hz two-pole Y-connected synchronous generator has a synchronous reactance of  $1.1 \Omega$  and an armature resistance of  $0.15 \Omega$ . The field circuit has a dc voltage of 200 V, and the maximum field current  $I_F$  is 10 A. The rated current of the generator is 262 A. An electronic circuit-based automation is employed to regulate the terminal voltage of the generator through ac-dc power electronic converter.

The open circuit characteristic of this generator is shown in Figure 1.

- How much field current is required to make the terminal voltage  $V_T$  equal to 2200 V when the generator is running at no load?
- What is the terminal voltage of this machine at rated load, if **automation is not done** for voltage control?
- What is the internal generated voltage of this machine at rated load, if **automation is not done** for voltage control?
- What is the internal generated voltage of this machine at rated load, if **automation is done** for voltage control?
- Is the error signal generated by the comparator positive or negative? Justify
- What shall be the output of the controller; increase in field current or decrease in field current? How much field current is required to make  $V_T$  equal to 2200 V when the generator is running at rated conditions?
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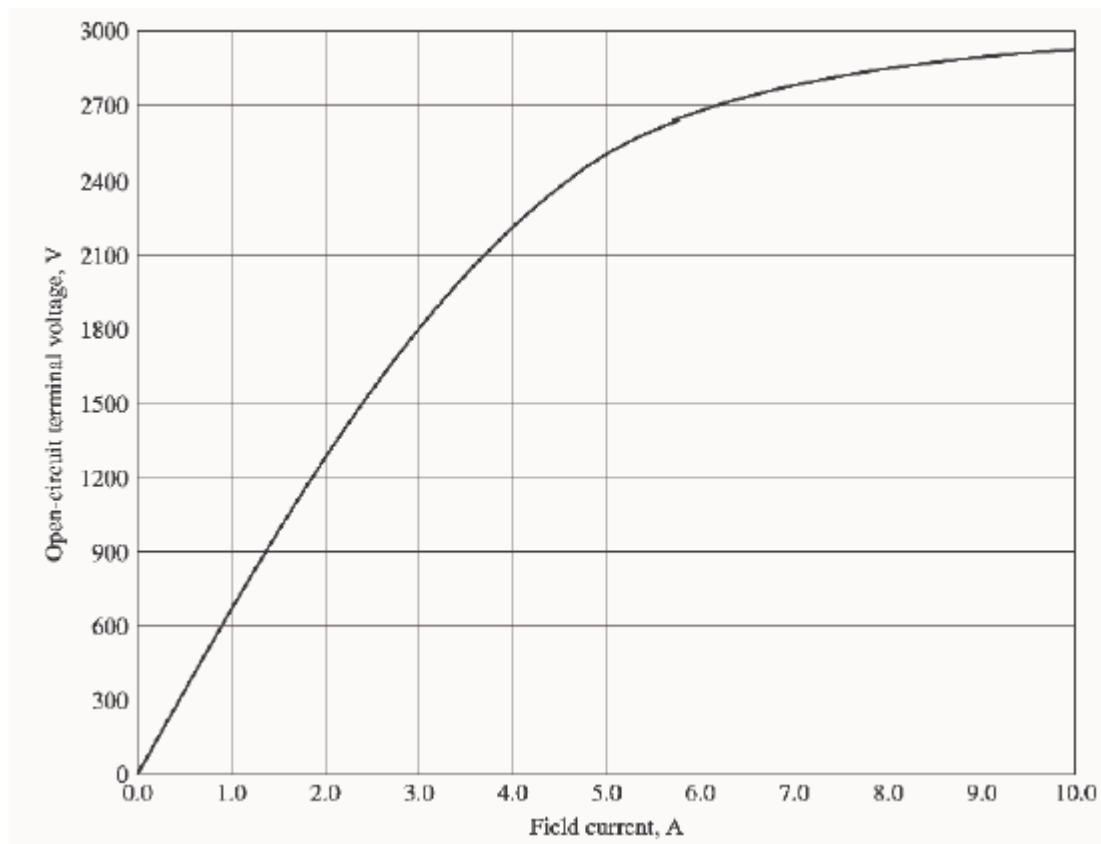


Figure-1: The open circuit characteristic of the generator