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Department of Electrical & Electronics Engineering

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Beyond Syllabus Details

Sl no.	Sem	Subject and Sub Code	Faculty Name	Topics	Date
1	III	ECA-18EE32	Dr. M J Chandrashekar	Network Topology	30-10-2021
2		T&G-18EE33	Dr. Sandeep S R	Special Transformers	03-01-2022
3		DSD-18EE35	Mr.Prakyath D	Introduction to VHDL	13-01-2022
4		E &EM-18EE36	Mrs.Rekha P S	Transducer in Measurements	23-02-2022
5	V	M&E-18EE51	Mrs.Vimala C S	16 Enterprenuership Trends for 2022-23/New forcast and a look into whats ahead	13-12-2021
6		MC -18EE52	Mrs.Prarthana J V	MCUS Road map and motor control application	20-12-2021
7		EMD-18EE55	Mr.Dwarakanath S K	Advancement in machine design	30-10-2021
8		H V-18EE56	Mr.Vijay Kumar K	Two In One comprehensive transformer testing system	12-10-2021
9	VII	PSP-2-18EE71	Mr.Kubera U	Reactive power voltage control	10-01-2022
10		PSP-18EE72	Mr.Prakyath D	Relay Interface with FPGA	11-01-2022
11		IDG-18EE733	Mr.Chiranth L N	SCADA and central Applications	08-12-2021
12		UEP-18EE742	Dr.J P Sridhar	Battery Mnanagement system in Electric Vehicle	03-01-2022
13		EV-18EE752	Mrs.Prarthana J V	Hybrid Electrical Vehicles- A nEw Era of Vehicles	04-01-2022
14		OE-18EE754	MrsTarakeshwari V	Energy Efficency coordination group work shop audits in the industry	16-12-2021

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Department of Electrical & Electronics Engineering

Power System Analysis – 2 [18EE71]

Beyond Syllabus

Topic: Reactive Power Voltage Control

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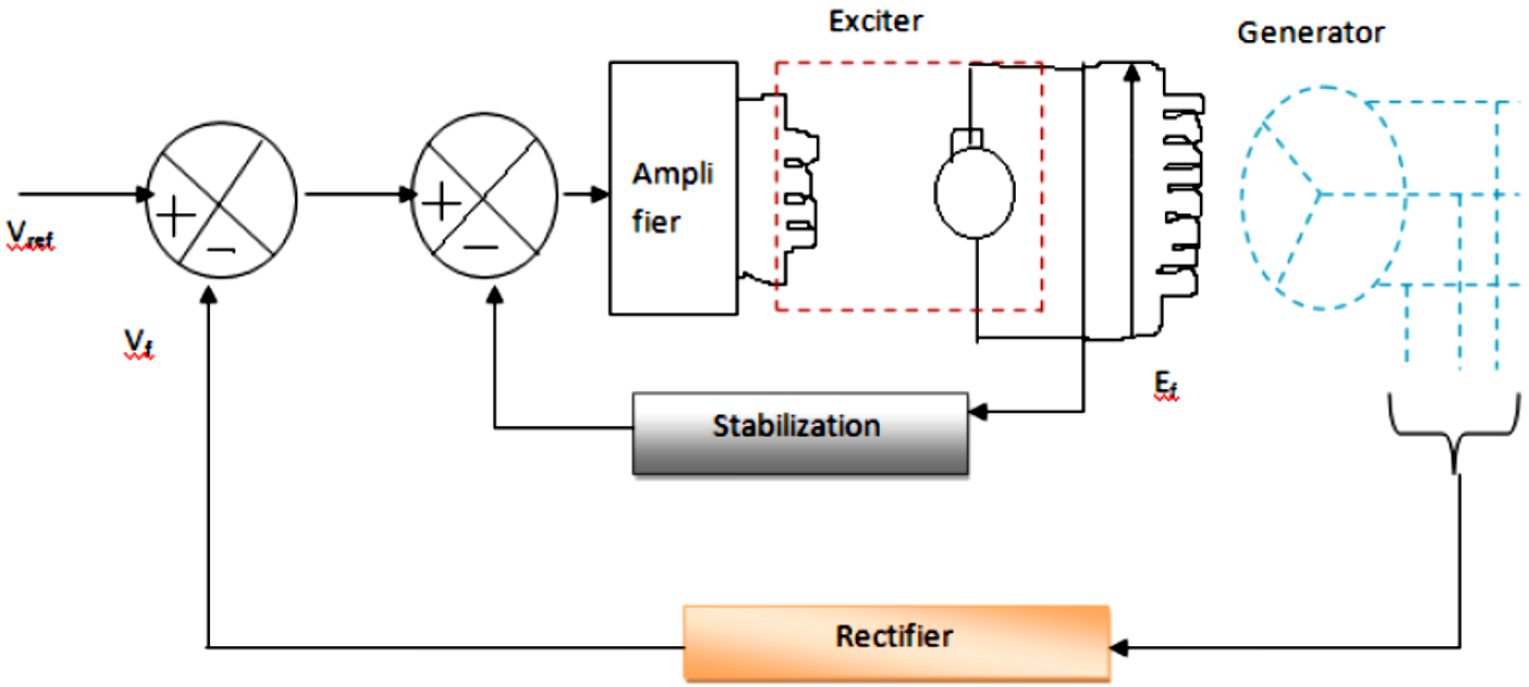
Contents

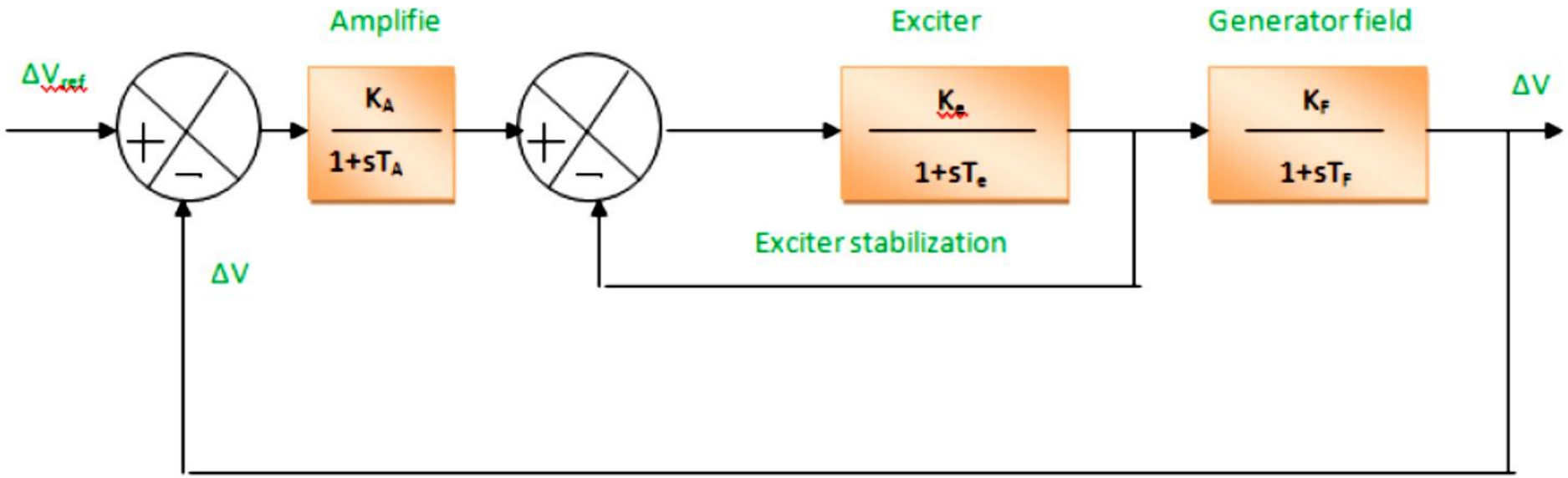
- Generator Voltage Control System
- Methods of Voltage Control

Generator Voltage Control System

The voltage of the generator is proportional to the speed and excitation (flux) of the generator. The speed being constant, the excitation is used to control the voltage. Therefore, the voltage control system is also called as excitation control system or automatic voltage regulator (AVR).



A schematic of excitation (voltage) control system



A simplified block diagram of voltage (excitation) control system

Methods of Voltage Control

In an AC supply system, the voltage can be controlled by the following methods.

1. Excitation control through voltage regulators at generating stations.

2. Employing Tap changing transformers

3. Employing Booster Transformers.

4. Inserting series capacitors in long EHVAC transmission lines.

5. Employing Switched or Fixed shunt Capacitor banks.

6. Switching in shunt reactors during light loads.

7. Use of synchronous condensers.

1. Excitation Control

- The terminal voltage of the alternator varies when the load on the supply system changes which is due to voltage drop in the synchronous impedance of the alternator.

- The voltage of the alternator cannot be controlled by adjustment of speed but by using excitation regulation.

- which can be regulated by use of automatic or hand regulator acting in the field circuit of alternator exciter.

- The quick acting voltage regulators based on the over-shooting the mark principle gives the quick response

2. Tap Changing Transformers

- As the excitation control method is limited only to small isolated systems, we have to go for other methods for long transmission lines. One method among them is a Tap changing transformer

- The basic principle is based on changing the ratio of transformation, which can be obtained by adjusting the turns on the primary or secondary depending upon the requirement.

- Principal tapping is one in which the tapping on the HV winding when connected to rated voltage gives rise to rated voltage on the LV side.

- Positive tapping, is tapping in which the number of turns are more than that of principal tapping whereas a negative tapping is one in which the tapping have loss number of turns than the principal tapping.

Generally tapping is provided on high voltage side due to following reasons.

1. Smooth and fine control output voltage can be possible as the number of turns on HV side is more.
2. Owing to insulation constraints the LV winding is placed nearer to the core and therefore it is difficult to tap LV winding.
3. Tap chargers on HV side has to carry low currents though it will need more insulation.

Generally, there are two types of tap changing's

1. OFF load tap changing
2. ON load tap changing

3. Booster Transformer

- If the voltage of a feeder has to be controlled at a point far away from the main transformer and if there is no provision for a tap changing gear in the main transformer then we have to use a special transformer which is known as Booster transformer.

- The primary of booster transformer is supplied from the secondary of the regulating transformer which is fitted with on load tap changing gear.

- The regulating transformer output is connected to the primary of the booster transformer in such a way that the voltage injected in the line is in phase with the supply voltage.

- The system becomes expensive if the regulation is required at a point where a main transformer is to be placed and it also requires more floor space and increases the losses.

4. Shunt Reactors

- Shunt Reactors are generally used to control steady state over voltages when operating under light-load conditions.

- The reactive power generated by the capacitance causes high voltages if the shunt reactors were not employed.

- The shunt reactive compensation is kept permanently in order to avoid over voltages and insulation stresses followed by sudden load rejection.

- The shunt reactors reduce the power transfer capability of the line.

5. Static Shunt Compensation

- Due to recent advances in power electronics and their component ratings these compensating techniques are provided to be far superior and have a step less control of variable compensation.

- A thyristorised control of shunt reactors and capacitors is provided. The stability improvement and transient voltage control can be possible by using static VAR system (SVS).

6. Synchronous Condensers

- Generally synchronous condensers are specially designed synchronous motors, which are used to control receiving end voltage of a transmission line. According to the load on the transmission line, by varying its excitation the watt less kVA is automatically varied.

- The main advantages of synchronous condensers are:
  1. Both ends of transmission line can be maintained with same voltage.
  2. At heavy loads power factor can be improved.
  3. As high terminal reactances are used better protection is possible to the line.

- The main disadvantages are supply interruption increases if synchronous condenser comes out of synchronism and short-circuit current increases.

Thank You