

Hall Ticket No:

Question Paper Code: AEE015



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER

B. Tech VII Semester End Examinations (Regular), November – 2019

Regulation: IARE–R16

### HIGH VOLTAGE ENGINEERING (Electrical and Electronics Engineering)

Time: 3 hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

#### UNIT – I

- 1 a) Explain the mechanism of lightning strokes including high over voltages on transmission line. [7M]  
b) Explain the process for power frequency over voltages. [7M]
- 2 a) Explain different methods employed for lightning protection. [7M]  
b) Explain with sketch the various theories of charge generation and discharging a thunder cloud? [7M]

#### UNIT – II

- 3 a) From the fundamental principles, derive Townsend's criteria for the breakdown of gaseous dielectric medium. [7M]  
b) Explain the various break down theories involved in commercial liquid dielectrics. [7M]
- 4 a) Explain in detail about various mechanisms of break down in vacuum. [7M]  
b) Explain the break down mechanisms involving in commercial solid dielectric break down. [7M]

#### UNIT – III

- 5 a) Explain the neat diagram generation of high DC voltage using vande-graff generator. [7M]  
b) Explain the Marx circuit arrangement for multistage impulse generator. [7M]
- 6 a) What is Tesla Coil? How is damped high frequency oscillations obtained from a Tesla coil [7M]  
b) Explain the working principle of cockroft-walton voltage multiplier circuit. [7M]

#### UNIT – IV

- 7 a) What is CVT? Explain how CVT can be used for high voltage AC measurements. [7M]  
b) Explain how a sphere gap can be used to measure the peak value of voltages? [7M]
- 8 a) Explain the operation of generating type voltmeter. [7M]  
b) Explain the operation of Electrostatic voltmeter. With neat sketch and give its advantages. [7M]

#### UNIT – V

- 9 a) Explain in detail about the insulation coordination. [7M]  
b) Explain the direct and synthetic testing of isolators and circuit breakers. [7M]

- 10 a) Explain the different high voltage tests conducted on bushings. [7M]  
b) Explain the different high voltage tests conducted on power transformers. [7M]



# INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

## COURSE OBJECTIVES:

The course should enable the students to:

I	Summarize the types of insulation and breakdown process used for power system protection.
II	Design the networks for generation of high direct current voltage , high alternating current voltage and to measure the same.
III	Identify the causes for over voltages and explain the principals of insulation co-ordination in high voltage power systems.
IV	Measure the various electrical parameters of insulation used for power system equipment for their With stand.

## COURSE OUTCOMES (COs):

CO 1	Describe the causes of over voltages and its effect and protection against over voltages by using protecting devices.
CO 2	Explain the different types breakdown process used in power system protection
CO 3	Construct the Generation of high voltages and currents and controlling of impulse generators
CO 4	Measure the high voltages and currents in power system by using different types of instruments and digital techniques.
CO 5	Use Analyzing the high voltage apparatus in power system using BIL and international standards and insulation level.

## COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AEE015.01	CLO 1	Study the effect of over voltage on power system and causes	PO1	3
AEE015.02	CLO 2	Check the causes which lead to over surges and over currents in power system.	PO1	2
AEE015.03	CLO 3	Identify the methods for protection against over voltages in power system.	PO1, PO3	3
AEE015.04	CLO 4	Discuss different phenomenon which leads to break down of gas insulation medium and specify the particular gas any power system apparatus.	PO1, PO4	3
AEE015.05	CLO 5	Explain the various methods which causes breakdown in liquid dielectric medium and their importance in power System protection.	PO1, PO4	3
AEE015.06	CLO 6	Illustrate the process which decreases the breakdown strength of solid insulating mediums and their application in power system.	PO1, PO4	3
AEE015.07	CLO 7	Design the networks for generation of high direct current Voltages and high alternating current voltages.	PO1, PO3	3
AEE015.08	CLO 8	Measure the value of high direct current voltages , high alternating current voltages , impulse voltage and current after generation..	PO1	3
AEE015.09	CLO 9	Analyze tripping and control of impulse generator.	PO1	2

AEE015.10	CLO 10	Determine the process which leads to over voltage and lightning phenomenon on power system equipment.	PO1	2
AEE015.11	CLO 11	Study the insulation co-ordination in safe operation of extra high voltage power system.	PO1	2
AEE015.12	CLO 12	Calculate the DC resistivity , loss factor and dielectric constant of different insulation mediums used in power system protection.	PO1, PO3	3
AEE015.13	CLO 13	Identify the difference between type test and routine test used to understand withstand capability of insulation system in power system.	PO4	2
AEE015.14	CLO 14	Examine the power system equipment like insulators, bushings, isolators and circuit breakers for their breakdown strength.	PO1, PO4	2
AEE015.15	CLO 15	Investigate the power system equipment like cable, transformers and surge arresters of their dielectric strength	PO1, PO4	2
AEE015.16	CLO 16	Understand importance of high voltage engineering, Insulation technology, generation, measurement and testing related to high voltage power system.	PO1, PO3, PO4	3
AEE015.17	CLO 17	Explore the knowledge and skills of employability to succeed in national and international level competitive examinations	PO1, PO3, PO4	3

#### MAPPING OF MODEL QUESTION PAPER QUESTIONS TO THE ACHIEVEMENT OF COURSE OUTCOMES

<b>SEE QUESTION No.</b>		<b>COURSE OUTCOMES</b>		<b>BLOOM'S TAXONOMY LEVEL</b>
1	a	AEE015.02	Check the causes which lead to over surges and over currents in power system.	Remember
	b	AEE015.01	Study the effect of over voltage on power system and causes	Remember
2	a	AEE015.03	Identify the methods for protection against over voltages in power system.	Understand
	b	AEE015.02	Check the causes which lead to over surges and over currents in power system.	Remember
3	a	AEE015.04	Discuss different phenomenon which leads to break down of gas insulation medium and specify the particular gas any power system apparatus.	Understand
	b	AEE015.05	Explain the various methods which causes breakdown in liquid dielectric medium and their importance in power System protection.	Understand
4	a	AEE015.06	Illustrate the process which decreases the breakdown strength of solid insulating mediums and their application in power system.	Understand
	b	AEE015.04	Discuss different phenomenon which leads to break down of gas insulation medium and specify the particular gas any power system apparatus.	Understand
5	a	AEE015.09	Analyze tripping and control of impulse generator.	Remember
	b	AEE015.10	Determine the process which leads to over voltage and lightning phenomenon on power system equipment	Understand
6	a	AEE015.10	Determine the process which leads to over voltage and lightning phenomenon on power system equipment	Remember
	b	AEE015.11	Study the insulation co-ordination in safe operation of extra high voltage power system	Understand
7	a	AEE015.13	Identify the difference between type test and routine test used to understand withstand capability of insulation	Remember

	b	AEE015.12	Calculate the DC resistivity , loss factor and dielectric constant of different insulation mediums used in power system protection.	Remember
8	a	AEE015.12	Calculate the DC resistivity , loss factor and dielectric constant of different insulation mediums used in power system protection.	Understand
	b	AEE015.12	Calculate the DC resistivity , loss factor and dielectric constant of different insulation mediums used in power system protection.	Remember
9	a	AEE015.15	Investigate the power system equipment like cable, transformers and surge arresters of their dielectric strength.	Remember
	b	AEE015.16	Understand importance of high voltage engineering, Insulation technology, generation, measurement and testing related to high voltage power system.	Understand
10	a	AEE015.14	Examine the power system equipment like insulators, bushings, isolators and circuit breakers for their breakdown strength	Remember
	b	AEE015.14	Examine the power system equipment like insulators, bushings, isolators and circuit breakers for their breakdown strength	Understand

**Signature of Course Coordinator**

**HOD, EEE**