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Question Paper Code: AEE504



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech VI Semester End Examinations (Regular), April– 2020

Regulation: IARE–R16

EXTRA HIGH VOLTGE AC TRANSMISSION

(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) What are the merits and problems of EHVAC transmission? [7M]
b) Illustrate the power handling capacity and line loss of EHVAC lines with various voltage levels? [7M]
- 2 a) What are the different mechanical considerations in line performance and explain in detail? [7M]
b) What are the properties of Bundled conductors and explain with neat sketches? [7M]

UNIT – II

- 3 a) Explain the voltage gradient distribution on Six-conductor bundle and gradient on sub-conductor. [7M]
b) Discuss the convenience offered by using modes of propagation and possible uses of this technique in EHV-AC lines [7M]
- 4 a) Describe the charge-potential relations of a transmission line with n conductors on a tower. [7M]
b) Derive an expression for Maximum Charge Condition on a 3-Phase Line [7M]

UNIT – III

- 5 a) Describe the difference between a line spectrum and band spectrum for noise. What is the difference between a pure tone and broad-band spectrum? [7M]
b) Explain generation of corona pulses and give their properties [7M]
- 6 a) Calculate and plot the field factors for the 3 modes of propagation for a line with $H=15$ m, $S= 12$ m as the distance from the line centre is varied from 0 to 3 H. [7M]
b) Why does line-generated corona noise not interfere with TV reception or FM radio reception? What causes interference at these frequencies? [7M]

UNIT – IV

- 7 a) Obtain electrostatic induction on unenergised circuit of double circuit EHVAC line [7M]
- b) Explain in-detail about meters and measurements of electrostatic field [7M]
- 8 a) Derive the general equations for voltage and current at any distance on the line in the operation form and illustrate with different conditions. [7M]
- b) Explain the travelling wave concept with standing waves and natural frequencies [7M]

UNIT – V

- 9 a) Explain briefly about torsional interaction, transient torque problem and discuss their counter measures [7M]
- b) Explain in detail sub synchronous resonance problems and counter measures. [7M]
- 10 a) a) A single-circuit 3-phase, 50 Hz, 400 kV line has a series reactance per phase of 0.327 ohm/km. Neglect line resistance. The line is 400 km long and the receiving-end load is 600 MW at 0.9 p.f. lag. The positive-sequence line capacitance is 7.27nF/km. In the absence of any compensating equipment connected to ends of line, calculate the sending-end voltage. Work with and without considering line capacitance. The base quantities for calculation are 400 kV, 1000 MVA. [7M]
- b) [7M]
- a) What is the reason for the existence of SSSR in the steady state and transient conditions in series capacitor compensated lines?
- b) Explain the voltage control using synchronous condensers.



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COURSE OBJECTIVES:

The course should enable the students to:	
I	Illustrate basic concepts of extra high voltage AC transmission and understand the need for it.
II	Outline the line and ground reactive parameters and voltage gradients of conductors.
III	Describe effects of corona and methods of associated measurement.
IV	Associate the knowledge of electro static field theory and traveling wave theory.
V	Select voltage control methods for extra high voltage AC transmission system.

COURSE OUTCOMES (COs):

CO 1	Student can learn about the trends in EHV AC transmission.
CO 2	Student can calculate the line inductance and capacitance of bundle conductors
CO 3	Student understands the effect of Corona and radio interference.
CO 4	Explore the concept of Electro static field and the travelling wave theory.
CO 5	Student can analyze compensated devices for voltage control.

COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:
AEE504.01	CLO 1	Student shall learn the necessity of EHVAC Transmission.
AEE504.02	CLO 2	Student will come to know the advantages and problems in EHVAC Transmission.
AEE504.03	CLO 3	Student learns the power handling capability and line losses in EHVAC Transmission.
AEE504.04	CLO 4	Student understands the concept of bundle conductors.
AEE504.05	CLO 5	Student can calculate line inductance.
AEE504.06	CLO 6	Student can calculate line capacitance
AEE504.07	CLO 7	Student learns the concept of sequence inductance and sequence capacitance.
AEE504.08	CLO 8	Student learns the concept of sequence inductance and sequence capacitance.
AEE504.09	CLO 9	Student learns different modes of propagation and ground return.
AEE504.10	CLO 10	Student can calculate gradient of bundle conductors.
AEE504.11	CLO 11	Student can solve various design examples.
AEE504.12	CLO 12	Student learns about the concept of power loss and audible noise due to Corona.
AEE504.13	CLO 13	Student can derive the formula for corona loss .
AEE504.14	CLO 14	Student can understand the relationship between single phase and three phase audible noise levels.

CLO Code	CLO's	At the end of the course, the student will have the ability to:
AEE504.15	CLO 15	Student learns the concept of radio interference.
AEE504.16	CLO 16	Student can calculate electrostatic field of EHV transmission lines.
AEE504.17	CLO 17	Understand the effect of electrostatic field on humans ,animals and plants.
AEE504.18	CLO 18	Student can estimate the electrostatic induction in un-energized circuit of double ,circuit line.
AEE504.19	CLO 19	Student can derive travelling wave expression and its solution
AEE504.20	CLO 20	Student learns about source of excitation and terminal conditions.
AEE504.21	CLO 21	Student learns about power circle diagram and its uses.
AEE504.22	CLO 22	Student understands the concept of synchronous condenser.
AEE504.23	CLO 23	Student learns the concept of static VAR compensation.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	A	AEE504.01	Student shall learn the necessity of EHVAC Transmission.	CO 1	Understand
	B	AEE504.02	Student will come to know the advantages and problems in EHVAC Transmission.	CO 1	Understand
2	A	AEE504.01	Student shall learn the necessity of EHVAC Transmission.	CO 1	Remember
	B	AEE504.02	Student will come to know the advantages and problems in EHVAC Transmission.	CO 1	Analyzing
3	A	AEE504.03	Student learns the power handling capability and line losses in EHVAC Transmission.	CO 2	Understand
	B	AEE504.04	Student understands the concept of bundle conductors.	CO 3	Understand
4	A	AEE504.05	Student can calculate line inductance.	CO 2	Understand
	B	AEE504.06	Student can calculate line capacitance	CO 2	Understand
5	A	AEE504.07	Student learns the concept of sequence inductance and sequence capacitance.	CO 3	Analyzing
	B	AEE504.06	Student can calculate line capacitance	CO 3	Understand
6	A	AEE504.08	Student learns the concept of sequence inductance and sequence capacitance.	CO 3	Understand
	B	AEE504.09	Student learns different modes of propagation and ground return.	CO 3	Understand

7	A	AEE504.10	Student can calculate gradient of bundle conductors.	CO 4	Remember
	B	AEE504.09	Student learns different modes of propagation and ground return.	CO 4	Understand
8	A	AEE504.10	Student can calculate gradient of bundle conductors.	CO 4	Understand
	B	AEE504.11	Student can solve various design examples.	CO 4	Understand
9	A	AEE504.12	Student learns about the concept of power loss and audible noise due to Corona.	CO 5	Analyzing
	B	AEE504.12	Student learns about the concept of power loss and audible noise due to Corona.	CO 5	Understand
10	A	AEE504.12	Student learns about the concept of power loss and audible noise due to Corona.	CO 5	Understand
	B	AEE504.13	Student can derive the formula for corona loss .	CO 5	Understand

Signature of Course Coordinator

HOD, EEE