

B TECH
(SEM-VIII) THEORY EXAMINATION 2018-19
EHVAC & DC TRANSMISSION

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

- a. State the two major advantages and disadvantages of HVDC transmission over HVAC.
- b. Compare EHVAC and HVDC Transmission system based on their respective technical and economic aspects.
- c. List the corona loss formulae based on voltages and voltage gradients.
- d. Explain the mechanism of formation of a positive corona pulse train.
- e. Differentiate between a hot lightning stroke and a cold lightning stroke.
- f. Why the over voltage occurs due to arching ground?
- g. Explain the operation of various types of HVDC links with suitable diagrams.
- h. How many types of faults that can occur in HVDC converters?
- i. Draw the schematic diagram of overcurrent protection in a pole of HVDC link.
- j. Explain the starting and stopping criterion of HVDC link.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

- a. What factors make underground transmission lines so much more expensive than overhead lines?
- b. Explain the limits for radio interference fields. Why does line generated corona noise not interfere with TV reception or FM radio reception?
- c. Draw a neat exact equivalent circuit of an Impulse Generator and indicate the significance of each parameter being used. Also, derive an expression for voltage efficiency of a single stage impulse generator.
- d. Explain the working of different components of a typical HVDC converter station with schematic diagram.
- e. Explain the controller characteristics of HVDC converters for following conditions:
 - (i) Normal operational condition
 - (ii) Control characteristic with negative current margin

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Calculate the power flow between the buses in Figure 1

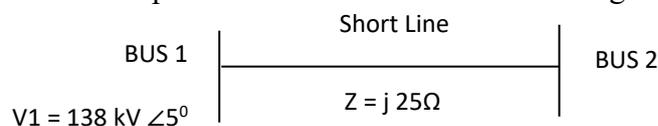


Figure 1

- (b) Explain the surface voltage gradient on conductors and derive the expression for maximum surface voltage gradients for 2-Conductor Bundle.

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the following terms used in EHVAC transmission systems with suitable diagrams (i) sub-transient reactance, (ii) transient reactance, (iii) synchronous reactance of a source, (iv) a.c. and d.c. components and (v) the interrupting current capacity of a circuit breaker.
- (b) Explain clearly how overvoltages are generated when interrupting (i) low inductive current and (ii) low capacitive current. Draw a figure showing ferro-resonance condition in a network when two poles of a circuit breaker are open, and one pole is closed. Also, explain the methods of reduction of switching surges on EHV systems.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the operation and application of a typical impulse current generator circuit. Also, explain the triggering and synchronization of the impulse generator and the CRO with neat diagram.
- (b) A 12-stage impulse generator has capacitors, and each has rated with $0.3 \mu\text{F}$, 150 kV. The capacitance of the test specimen is 400 pF. Determine the wave front and wave tail resistances to produce a 1.2/50 μ sec. impulse wave. Also determine the maximum output voltage if the charging voltage is 125 kV.

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the hierarchical control structure of HVDC link and firing control schemes of converter controllers with block diagram representations.
- (b) A six-pulse inverter is operating at a constant margin angle of 18° . The valve side voltage is 70.7 kV (line to line) and the leakage reactance of the converter transformer is 10 ohms. Compute the extinction angle, overlap angle and DC voltage when (i) $I_d = 2500 \text{ A}$ and (ii) $I_d = 4200 \text{ A}$.

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the functions and role of smoothing reactors in HVDC link operations with mathematical justification.
- (b) Explain the potential applications and types of Multiterminal DC systems.

B. TECH.
THEORY EXAMINATION (SEM-VIII) 2016-17
EHV AC& DC TRANSMISSION

Time : 3 Hours

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Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. Attempt all of the following questions:

10 x 2 = 20

- (a) Define audible noise.
- (b) Define corona.
- (c) Write standard transmission voltage.
- (d) Why HVDC system is best for EHV AC system?
- (e) Write the names of filters used in the HVDC system.
- (f) What do you understand by surface voltage gradient?
- (g) Define impulse generator.
- (h) Define the significance of impulse tests.
- (i) Define flash over and 50% flash over voltage.
- (j) What are the causes of over currents?

SECTION – B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) What are the causes of over voltage in converter station? How would you protect the converter station equipment from these over voltage?
- (b) Derive an equation for calculating the maximum electric intensity on the conductor surface of a three phase single circuit horizontal configuration line with two sub conductor per phase.
- (c) Explain mechanical consideration in transmission line.
- (d) What are the methods are used reducing the switching surge in EHV line?
- (e) Explain the Damper and Spacers EHV AC-DC system.
- (f) Discuss the design aspect of EHV lines, design factor under steady state condition.
- (g) For $r=1\text{cm}$, $H=5\text{m}$, $f=50\text{Hz}$, calculate corona loss P_C according to peek's formula when $E=1.1E_0$ and $\delta=1$
- (h) Discuss corona pulses, their generation and properties

SECTION – C

Attempt any two of the following questions:

2 x 15 = 30

3. What do you meant by MTDC system? What are the different types of MTDC system? Explain and compare each type of MTDC system.
4. What are Explain the voltage multiplier circuits. Also explain the cascade connection of transformer for producing very high ac voltages
5. Discuss method of measuring high impulse currents. Discuss in detail about Sphere Gap measurements. What are its advantages and limitations for high voltage measurement?

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Paper Id:

120815

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B TECH
(SEM VIII) THEORY EXAMINATION 2017-18
EHV AC & DC TRANSMISSION

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x10 = 20

- a. What do you mean by bundled conductor?
- b. What is the need of high voltage transmission?
- c. Explain the principle of half wave transmission.
- d. What is the effect of Radio interference on EHV AC lines?
- e. Why the testing of high voltage lines is necessary?
- f. What are the effects of pollution on high voltage transmission?
- g. What are the advantages of HVDC transmission over HVAC transmission?
- h. What are the problems associated with the HVDC transmission
- i. What are surge arresters?
- j. What are the applications smoothing reactor?

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

- a) Derive the relation for the maximum surface gradient for the bundled conductor having two conductors.
- b) Explain overvoltage caused by the interruption of low inductive current and capacitive currents.
- c) Explain methods for the generation of high DC voltage.
- d) What is the principle of dc link control? Explain firing angle control and current & excitation angle control methods
- e) Why are multiterminal DC system needed? What are the different types of MTDC used?

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

- (a) Explain distribution of voltage gradient on sub-conductors of bundle and derive the relation for total field intensity.
- (b) Compare AC and DC high voltage transmission and explain modern trends in EHV AC and DC transmission

- 4. Attempt any one part of the following: 10 x 1 = 10**
- (a) Explain Corona formation and factors affecting it also derive the formula for Corona loss and Corona current.
 - (b) Explain the generation of Corona pulses and give its properties.
- 5. Attempt any one part of the following: 10 x 1 = 10**
- (a) What are the methods of measurement of the high AC voltages? Explain anyone in detail.
 - (b) Explain the factors for designing of EHV lines under steady state conditions. Also give its limitations which will govern the design of lines.
- 6. Attempt any one part of the following: 10 x 1 = 10**
- (a) Describe with neat sketch different types of dc links. Why is bipolar line more commonly used?
 - (b) What do you mean by converter station of HVDC transmission system? Explain the effect of source inductance on the operation of converters.
- 7. Attempt any one part of the following: 10 x 1 = 10**
- (a) What are the noncharacteristic harmonics in HVDC systems? How are they generated?
 - (b) Discuss the nature and types of faults on DC side of converter stations. How are the faults sensed and cleared?

- iii) The maximum current which the circuit breaker contacts have to carry.
- iv) The maximum interrupting current of the breaker if the contacts part after $1\frac{1}{2}$ cycle ($f=50\text{Hz}$).
11. a) Write a note on generation and mitigation of harmonics in HVDC systems.
- b) Describe in brief Ferro-Resonance overvoltage.
12. a) Explain the principle of half wave transmission in power environments. Also discuss the advantages of half wave transmission.
- b) What are the important devices of FACTS? Explain the role of any one FACTS controller.

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(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 120755

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B.Tech.

(SEM. VI) THEORY EXAMINATION, 2015-16

EHV AC & DC TRANSMISSION

[Time:3 hours]

[Total Marks:100]

SECTION-A

Attempt all parts. All parts carry equal marks. (2 × 10 = 20)

- (a) Give two major considerations in mechanical design of the transmission line.
- (b) What is the need of EHVAC transmission in the current scenario?
- (c) List the methods of reduction of switching surges in EHV system.
- (d) Define 'Tail Time' and 'Front time' in impulse voltage waveform. uptonline.com
- (e) List various types of converter control scheme.
- (f) What is Marx Multiplier circuit and where is it used?

- uptuonline.com
- (e) What do you mean by the term 'Insulation Coordination'?
- (h) Write down three specific areas of application for MTDC system.
- (i) Explain the choice of voltage level in DC transmission System in brief.
- (j) Why is the reversal of power in HVDC link done?

SECTION-B

Attempt any five question from this section. (5 × 10 = 50)

2. Discuss the technical and economic advantages of DC transmission System?
3. Derive in brief about measurement of high voltage using:
- Sphere Gap, and
 - Purely capacitive potential divider.
4. a) Describe with the help of a neat diagram the control hierarchy of the bipolar HVDC system.
- b) Discuss in brief the back to back type of HVDC link. uptuonline.com
5. What is a smoothing reactor? How are the converters protected from over voltages?

6. a) For $r=1$ cm, $H=5$ cm, $f=50$ Hz, Calculate corona loss (P_c) according to the Peek's formula when $E=1.1 E_0$ and $\delta = 1$. The term used bear the usual meaning. uptuonline.com
- b) Describe the power loss calculation of corona loss based on voltage and voltage gradient.
7. Write a detailed note on design of EHV lines based on steady state limits.
8. Describe the various types of converter faults. What protection is used against over currents in an HVDC system?
9. What are the various method of generating High AC voltage? Draw a schematic diagram to depict internal arrangement of 2 unit cascade-connected transformer with excitation and measuring circuits.

SECTION-C

Attempt any two questions from this section. (2 × 15 = 30)

10. A 400 kV system has a generated capacity of 2000 MVA. Calculate.
- The Normal current uptuonline.com
 - The rms value of the short circuit current for a bus fault on the transformer HV winding, if $X_d' + X_1 = 0.5$ pu base on the 400 kV.