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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 lighting stroke and a cold lighting 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

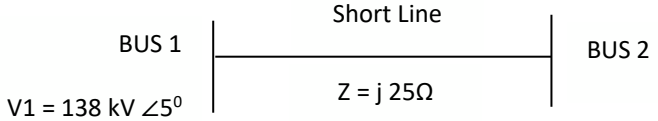

Figure 1

(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 μF, 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 18^0. 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 A and (ii) I_d = 4200 A.

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

(a) Explain the functions and role of smoothing rectors in HVDC link operations with mathematical justification.

(b) Explain the potential applications and types of Multiterminal DC systems.