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B.Tech.
(SEM VII) THEORY EXAMINATION 2022-23
HVDC & AC TRANSMISSION

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

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

(a) How radio interference affects the performance of EHV AC lines?
(b) Why bundled conductors are preferred for EHV transmission?
(c) How corona power loss related to frequency of supply?
(d) Explain the principle of half wave transmission.
(e) How pollution affects the performance of EHV AC lines?
(f) What is the need of testing of EHV AC lines?
(g) What is the difference between controlled rectifier and uncontrolled rectifier?
(h) What is the effect of source inductance on the average output voltage of 1-ϕ full wave rectifier?
(i) How many types of faults that can occur in HVDC converters?
(j) Why smoothing reactor required in power converters?

SECTION B

2. Attempt any *three* of the following: 10x3 = 30

(a) Explain the technical and economical reasons for adopting EHV transmission system for transfer of bulk power over long distance.
(b) 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) the interrupting current capacity of a circuit breaker.
(c) Explain the design factors of EHV line under steady state limits.
(d) Why the converters with higher pulse number are used for HVDC transmission system. Explain in detail.
(e) List any three HVDC projects currently used in India. Also explain the technical specifications of each HVDC project.

SECTION C

3. Attempt any *one* part of the following: 10x1 = 10

(a) Explain the surface voltage gradient on conductors and derive the expression for maximum surface voltage gradients for bundled conductor (2 conductors).
(b) Illustrate the power handling capacity and line loss of EHVAC lines with various voltage levels.

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4. Attempt any *one* part of the following: 10 x1 = 10

(a) Explain the formation of corona. What are the factors which affects the formation of corona?

(b) Write a short note on
   (a) Ferro-resonance
   (b) Radio interference in EHVAC lines

5. Attempt any *one* part of the following: 10x1 = 10

(a) A 12-stage impulse generator has capacitors, and each has rated with 0.45 μF, 150 kV. The capacitance of the test specimen is 500 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.

(b) Draw the 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.

6. Attempt any *one* part of the following: 10x1 = 10

(a) A six-pulse inverter is operating at a constant margin angle of 180. The valve side voltage is 70.7 kV (line to line) and the leakage reactance of the converter transformer is 20 ohms. Compute the extinction angle, overlap angle and DC voltage when (i) Id= 2400 A and (ii) Id = 4200 A.

(b) Describe various types of HVDC links with the help of neat and labeled diagrams. Discuss the applications of each of HVDC link.

7. Attempt any *one* part of the following: 10x1 = 10

(a) How we can reduce total harmonic distortion (THD) and ripple factor on the AC and DC sides of converters? Explain in detail?

(b) Explain the importance of multi-terminal DC transmission? What are the different types of MTDC system used?

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