B.E. Eighth Semester (Electrical Engineering (Electronics & Power)) (C.B.S.)

Elective - II : EHVAC & HVDC Transmission System

P. Pages : 2 **KNT/KW/16/7574**

Time : Three Hours * 0 3 3 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.

1. a) Prove that the percentage power loss in EHVAC transmission line is independent of its length and it depends on the ratio of conductor resistance to the positive sequence reactance per unit length. **6**

b) A power of 3000 mw is to be transmitted from super thermal power station over a distance of 800 km. use 400 kv and 750 kv alternatives. Suggest number of circuits required with 40% series capacitor compensation and calculate the total power loss and loss per Km. Assume $\delta=30^{o}$ and values of 'x' and 'r' are specified below. **8**

System Kv	400	750
x(Ω/km)	0.327	0.272
r(Ω/km)	0.031	0.0136

OR

2. a) In case of a bundled conductor if is observed that voltage gradient follows cosine law on the surface conductor. Justify with a related waveforms. **6**

b) Calculate the maximum voltage gradient on the center and outer phases of 3 conductors in case of EHVAC transmission system of 735 kV line. The line parameters are N=4, r=0.0176 m, B= 0.4572 m. for the bundled conductor of each phase. The line height and phase spacing in horizontal configuration are H=15m. and S=15 m. Use Mangoldt formula. **8**

3. a) Derive the expression for the electrostatic induction on unenergized circuit of a single circuit AC line. **7**

b) A single conductor of 525 KV line having radius of 0.032 m is string 13 m above the ground. Calculate: **6**
i) Corona Inception voltage.
ii) The effective radius of conductor to ground at an over voltage of 2.5 pu.
iii) Capacitance of conductor to ground with and without corona.
iv) Corona power loss.

OR

4. Write short notes on:
i) Charge - voltage diagram for corona. **5**
ii) Procedure for the measurement of Electrostatic fields. **4**
iii) Effect of radio-interference and audible noise due to corona. **4**

5. a) Compare EHVAC and HVDC in the following aspects: **6**

i) Skin effect. ii) Insulation level.

iii) Power flow control. iv) Power transfer stability limit.

b) Describe various configurations of earth electrodes used in HVDC Schemes. **7**

OR

6. a) State the different kinds of HVDC link along with their advantages disadvantages and application. **7**

b) Explain the function & types of MTDC System. **6**

7. a) Draw and explain the constant current and constant extinction angle control characteristics of HVDC system. **7**

b) A bridge connected rectifier operates with $\alpha = 30^o$, $\nu = 15^o$. Determine necessary line secondary voltage of the rectifier transformer which is rated at 220/110 kv, if it is required to obtain a dc output voltage of 100 kv. Also determine the tap-ratio required. **6**

OR

8. a) What are the objectives of operating DC link in parallel with AC line. Explain how its objectives are achieved. **6**

b) Explain in detail the working of 3 phase bridge convertor circuit (Graetz Bridge) for HVDC transmission. **7**

9. a) Explain in detial configuration of AC Harmonic filters. With grouping of AC filter branches. **7**

b) Explain the causes of Harmonics. How Harmonics affects the power transfer Capability of transmission system what are its remedial measures. **6**

OR

10. a) Derive an expression for the reactive power requirement of HVDC substations. **7**

b) Give the design criteria for single frequency tuned filter. **6**

11. a) Explain the overvoltage protection of HVDC system. **7**

b) Explain insulation coordination in HVDC transmission system. **7**

OR

12. a) Explain in detail the function of MRTB. **7**

b) Discuss the characteristics of HVDC circuit Breaker. Explain how commutation principle is used for HVDC circuit Breaker. **7**

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