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Total No. of Pages : 02

Total No. of Questions : 08

**M.Tech.(EE) (2013 Batch E-III) (Sem.-3)**  
**EHVAC & HVDC TRANSMISSION SYSTEM**  
**Subject Code : MTEE-301C**  
**M.Code : 72226**

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTION TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1. Compare the EHVAC and HVDC system in terms of economics and technical performance. Enlist the major links in India for both EHVAC and HVDC system. Mention some of the demerits of EHVAC transmission system.

2. a) For 400 KV, evaluate the maximum surface voltage gradient on the central conductor in horizontal configuration at maximum operating voltage of 420 KV rms. Data given is

$$H = 13\text{m}$$

$$S = 11\text{m}$$

$$N = 2 \text{ sub-conductor each of } r = 0.0159\text{m}$$

$$B = 0.45\text{m}$$

$$\text{Given } E_{cm} = \frac{1 + (N-1)r/R}{Nr * \ln \left[ \frac{2H}{\gamma_{eq}} * 1 / \sqrt{1 + \frac{2H^2}{S}} \right]} * V_{l-g}$$

- b) Explain the concept of travelling waves in EHV lines.

3. a) Discuss the role of SVC in long transmission line. Give the modeling and control characteristics of SVC.
- b) The dimensions of a 3-phase 765-kV horizontal line, Fig. 1, are : H = 15m, S = 11 m phase separation, conductor  $2 \times 3.18$  cm dia, and B = 45.72 cm. Calculate the matrix of inductances per km, for untransposed configuration.

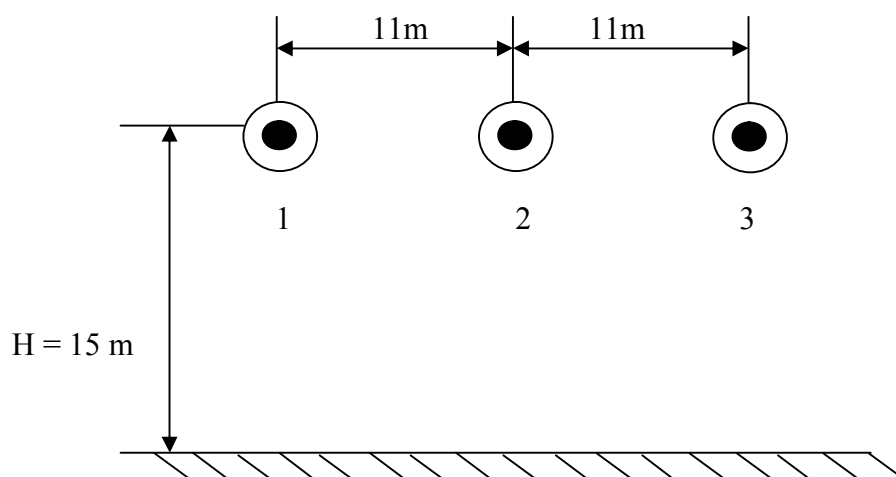


Fig.1

4.
  - a) A  $\pm 400$  KV DC transmission line to be compared with 750 KV three phase EHVAC system for equal power transmission. Show that power loss in bipolar DC system is 33% less than the three phase AC system
  - b) Draw the control characteristics of DC link. What is CC and CEA control. Suggest the control adopted during different modes of operation.
5.
  - a) Identify the various sources for generation of harmonics in HVDC systems and mention various adverse effects caused due to the presence of harmonics.
  - b) Give the algorithm for AC DC power flow. List the assumptions made if any.
6.
  - a) Give the complete schematic diagram of HVDC system. Give the purpose of each part.
  - b) The ac voltage at the rectifier end is 220 KV. Estimate the sixth harmonic voltage of a 6 pulse converter when :
    - i)  $\alpha = 0$  and  $\mu = 0$
    - ii)  $\alpha = \pi/2$  and  $\mu = 0$ .
7.
  - a) Derive an expression for Peek's formula for corona loss.
  - b) The following data for a 750 kV line are given. Calculate the corona loss per kilometer and the corona loss current. Rate of rainfall  $r = 5$  mm/hr.  $K = 5.35 \times 10^{-10}$ ,  $P_{FW} = 5$  kW/km  $V = 750$  kV, line-to-line.  $H = 18$  m,  $S = 15$  m phase spacing,  $N = 4$  sub-conductors each of  $r = 0.0175$  m with bundle spacing  $B = 0.4572$  m. (Use Bundle radius  $R = B/\sqrt{2}$ ). Use surface voltage gradient on centre phase for calculation. Comment on the result in foul and fair weather condition.
8. Write short note on the following :
  - a) Multi terminal system
  - b) Radio and TV interference

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**