

## M. Tech.

## EHV AC TRANSMISSION

SUBJECT CODE : PEE - 514 (Elective - I)Paper ID : [E0490]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 100

## Instruction to Candidates:

- 1) Attempt any **Five** questions.
- 2) All questions carry equal marks.

- Q1)** (a) List levels of transmission voltages which are used all over the world. What levels of above voltages are regarded as EHV AC transmission-Voltages-discuss.
- (b) Give configuration of EHV- towers and discuss one of the most popular tower used in EHV AC transmission.
- Q2)** (a) Discuss temperature rise of conductors and current carrying capacity in EHV AC system.
- (b) Discuss how will you select appropriate cable for EHV AC transmission system.
- Q3)** (a) Define 'voltage gradient' of conductors in an EHV AC system. How is it possible to calculate for maximum surface voltage gradient - discuss.
- (b) A 735 kV line has the following parameters :  
 $N = 4$ ,  $r = 0.0176\text{m}$ , distance  $B = 0.4570\text{m}$  for the bundled conductor of each phase. The line height and phase spacing in horizontal configuration are  $H = 15\text{m}$  &  $S = 15\text{m}$ . Calculate the maximum surface voltage gradients on the centre phase and the outer phases.
- Q4)** (a) What are Corona-Loss formulae? Write expressions for Corona-Loss relations based on voltages.
- (b) For the conductor radius ( $r$ ) = 1 cm, height ( $H$ ) = 5m, frequency ( $f$ ) = 50 Hz, calculate Corona Loss ( $P_c$ ) for  $E = 1.1 E_0$  and air density ( $\delta$ ) = 1. Also derive the formula used for  $P_c$ .

- Q5)** (a) What are audible noise (AN) and radio interference (RI)? Indicate their limits in EHV AC lines.
- (b) What is meant by Day-Night equivalent noise level? The  $L_{50}$  level of a line is 55 dB (A). The day-night hours are 15 and night time is 9 hours in duration. Calculate the day-night equivalent and decibel adder (dB(A)) to the day time AN-level.
- Q6)** Discuss electrostatic field of EHV AC lines. Also discuss the effect of high electrostatic fields on human beings under a line. Why does a normal human being not experience a shock when walking underneath an EHV - line? Why do birds survive even though they come into contact with EHV - transmission lines?
- Q7)** (a) What is lightning strokes to EHV lines? Also elaborate Lightning - stroke mechanism.
- (b) Discuss general principles of the Lightning protection problem.
- Q8)** (a) What is meant by compensation of a long EHV - line? What are different methods of compensation - discuss.
- (b) Consider the simple two-machine transmission model in which VAR - compensator is shunt connected at the midpoint of the line. Show that relationship between Active power (P), Reactive power (Q) and Load angle of the generating unit ( $\delta$ ) for ideal shunt compensation are

$$P = 2 \frac{V^2}{X} \sin \frac{\delta}{2}$$

$$Q = 4 \frac{V^2}{X} \left( 1 - \cos \frac{\delta}{2} \right)$$

Where symbols used represent usual meanings.

