BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VII**
BRANCH: EEE **SESSION : MO/2019**

SUBJECT : EE8217 EHV POWER TRANSMISSION

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Prove that - $R_{eq} = (6.r.R^5)^{\frac{6}{36}}$,Where R_{eq} is the Geometrical Mean radius for bundle of 6 sub-conductors having bundle radius R and bundle spacing B. [2]

(b) Consider a matrix [A] given below: [2]

$$[A] = \begin{pmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{pmatrix}$$

Calculate the (1) Eigen values of matrix [A] (2) Model Matrix [M], Where M is the Eigen vectors of matrix [A]. & (3) Diagonalize the matrix [A].

(c) Explain about effects of conductor resistance of e.h.v lines. [1]

Q2 (a) Explain about field of sphere gaps for measurements of extra high voltages. [2]

(b) Mention the significance of Mangoldt formulae and deduce the expression of surface voltage gradient for the outer phases in case of 3-phase ac line with horizontal configuration of phase. [3]

Q3 (a) How conductor size, transmission line length & phase difference between sending and receiving end voltages affect the power handling capacity of a EHV lines? [2]

(b) A Charge of 20 µC is placed at a distance of 4 meters from the centre of a sphere of radius 1 metre (2-metre diameter sphere). Calculate the magnitude, polarity, and location of a point charge Q_2 which will make the sphere at zero potential. [3]

Q4 (a) In case of low loss transmission line. (Assume no load conditions.) [2]

Prove that $|I_s| = \sqrt{c/L}$. sin βl . $|v_R|$

And $C = (1/\omega Z_0)$. Sin βl farad.

(b) Explain about the improvements obtained by the use of static var compensators (SVC). [3]

Q5 (a) In case of Transmission line with shunt reactor compensation for voltage control at no load, Prove that the generalized constants for the entire system is- [2]

$$\begin{pmatrix} A_T & B_T \\ C_T & D_T \end{pmatrix} = \begin{pmatrix} A & B \\ C & D \end{pmatrix}_{Line} - jB_{sh} \begin{pmatrix} B & 0 \\ 2A - jB_{sh}B & B \end{pmatrix}$$

, where B_{sh} is real number.

(b) Using the property of transmission line with shunt reactor compensation for voltage control at no load (Assume $|E_S| = |E_R| = E$) & $B_{Sh} = 2$) .Prove that- $\left|\frac{B}{(A-1)}\right| = 0.5$, where terms have own standard meanings [3]

Q6 (a) Write short technical notes on the following- [5]

(1) Corona loss and methods of its reduction.

(2) Neutral grounding System & charge matrix.