**[6179]-211**
## S.E. (Electrical Engineering)
## POWER SYSTEM - I
## (2019 Pattern) (Semester - IV) (203145)

*Time : 2½ Hours]*                                                                 *[Max. Marks : 70*

*Instructions to the candidates:*

1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable additional data, if necessary.*
5) *Use of non-programmable calculator is allowed.*

**Q1)** a) What are the Main components of overhead lines? **[4]**

b) Explain in brief what are different types of line supports hence state requirements of line supports? **[6]**

c) A 3-phase transmission line is being supported by three disc insulators. The potential across top unit and middle unit are 8 kV and 11kV respectively. Calculate: **[8]**

   i) The ratio of capacitance between pin and earth to the self-capacitance of each unit

   ii) The line Voltage.

   iii) String efficiency.

**OR**

**Q2)** a) What is String Efficiency? **[4]**

b) Describe the advantages & applications of Pin type & Suspension type insulator? **[6]**

c) Each line of a 3-phase system is suspended by string of three similar insulators if the voltage across line unit is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **[8]**

**Q3)** a) Define the G.M.D. for inductance calculation? **[3]**

b) Explain in details the Skin effect & Proximity effect? **[6]**

c) Derive an expression for the inductance of three phase overhead transmission line with symmetrical & unsymmetrical spacing with transposition. **[8]**

**OR**

*P.T.O.*

*Q4)* a) Define the G.M.R. for inductance calculation? **[3]**

b) What are bundled conductors? Discuss the advantages of bundled conductors when used for overhead lines. **[6]**

c) Derive an expression for Internal & External flux linkages due to single current carrying conductor. **[8]**


*Q5)* a) What do you mean by Electric Potential? **[4]**

b) Derive the expression for capacitance of single phase transmission line considering effect of earth. **[6]**

c) Derive an expression for the Capacitance of three phase overhead transmission line with symmetrical & unsymmetrical spacing with transposition. **[8]**

OR

*Q6)* a) What is the need of transposition for Capacitance calculation? **[4]**

b) Derive an expression for the capacitance to neutral of a three phase line with equilateral spacing. **[6]**

c) Explain the concept of G.M.D. & G.M.R. for Capacitance calculation? **[8]**


*Q7)* a) Classify the transmission line based on length & voltage level. **[3]**

b) Derive the expression for ABCD constants of medium transmission line considering nominal '$\pi$' model of the line. **[6]**

c) Define generalised circuit constants of transmission line, write general relationship between sending end and receiving end quantities hence state properties of transmission lines from ABCD constants. **[8]**

OR

*Q8)* a) What do you mean by Ferranti Effect? **[3]**

b) Derive an expression for voltage regulation of short transmission line. **[6]**

c) Draw neat circuit diagram and phasor diagram of following transmission line models. **[8]**

i) Medium transmission line Nominal 'T' model.

ii) Medium transmission line Nominal '$\pi$' model.


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