Total No. of Questions : 8]

SEAT No. :

PE-4240

[Total No. of Pages : 3

[6582]-11
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) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Non-Programmable Calculator is allowed.***

Q1) a) Enlist the main components of overhead lines, and discuss any one in detail. **[4]**

b) Define string efficiency. Derive the expression for string efficiency of a suspension insulator consisting of three discs. **[6]**

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

OR

Q2) a) Explain methods of improving string efficiency. **[4]**

b) Derive an expression for sag in case of overhead transmission line when the supports are at equal level. **[6]**

c) An insulator string consists of three units, each having a safe working voltage of 15kV. The ratio of self-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. Also find the string efficiency. **[8]**

P.T.O.

Q3) a) Write a short note on : **[3]**

i) Skin effect

ii) Proximity effect.

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

c) Derive an expression for inductance of three phase transmission line with symmetrical spacing. Draw a neat diagram. **[8]**

OR

Q4) a) Explain the concept of GMD and GMR for inductance calculation. **[3]**

b) Derive an expression for capacitance per kilometre of single phase overhead line having distance 'd' between the conductors and 'r' is the radius of each conductor. **[6]**

c) A3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition. **[8]**

Q5) a) Derive an expression for capacitance per kilometre of single phase overhead line. **[4]**

b) What do you understand by electric potential? Derive an expression for Electric potential at conductor in a group of charged conductors. **[6]**

c) Derive an expression for the capacitance to neutral of a three phase line with equilateral spacing. **[8]**

OR

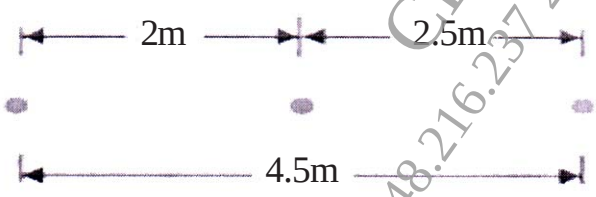
Q6) a) What is the need of transposition for Capacitance calculation? **[4]**

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

c) A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. The conductor diameter is 1.25 cm. If the line length is 100km, calculate **[8]**

i) Capacitance per phase

ii) Charging current per phase, Assuming complete transposition of the line



Q7) a) State and expalin in short Ferranti effect? **[3]**

b) Derive an expression for ABCD constants of short transmission line. **[6]**

c) Obtain the relationship between sending end voltage and current in terms of receiving end voltage and current for a medium transmission line using 'nominal T' method. Draw a neat phasor diagram. **[8]**

OR

Q8) a) Classify transmission lines based on length and voltage levels. **[3]**

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

c) An overhead 3-phase transmission line delivers 5000 kw at 22 kV at 0.8 p.f. lagging . The resistance and reactance of each conductor is 4 Ω and 6Ω. Respectively. Determine **[8]**

i) Sending end voltage

ii) Percentage regulation

iii) Transmission efficiency