Total No. of Questions : 8]

SEAT No. :

PD-4057

[Total No. of Pages : 3

[6402]-16
S.E. (Electrical)
POWER SYSTEM - I
(2019 Pattern) (Semester - IV) (203145)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Attempt 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) ***Assume suitable additional data, if necessary.***
4) ***Draw neat & clean diagrams if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Define span length. State the factors to be consider for selection of span length. **[4]**

b) Discuss any two types of line supports used in overhead lines and their advantage and disadvantages. **[6]**

c) A transmission line has a span of 150 m between level supports. The conductor has a cross-sectional area of $2cm^2$. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length, Calculate

i) sag ii) vertical sag. **[8]**

OR

Q2) a) Define pin type and shackle type insulator with their application. **[4]**

b) Describe any two methods for improving string efficiency in overhead line insulators. **[6]**

c) In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find (i) Voltage across string (ii) the distribution of voltage over 3 insulators and (iii) string efficiency. **[8]**

Q3) a) State skin effect, enlist the factors responsible for skin effect. **[3]**

b) A single phase line has two parallel conductors 2m apart. The diameter of each conductor is 1.2cm. Calculate the loop inductance per km of the line. **[6]**

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

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OR

Q4) a) Define concept of self and mutual G.M.D. **[3]**

b) Calculate the inductance of each conductor in a 3-phase, 3-wire system when the conductors are arranged in horizontal plane with spacing such that D_{31} = 4m, $D_{12} = D_{23}$ = 2m. The conductors are transposed and have a diameter of 2.5cm. **[6]**

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

Q5) a) What is the need of transposition for capacitance calculation? **[4]**

b) A 3-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2 m side. The diameter if each conductor is 1.25cm. Calculate capacitance of each line conductor per km. **[6]**

c) Derive the expression of capacitance of 3-phase overhead line with unsymmetrical spacing considering transposition. **[8]**

OR

Q6) a) Explain the concept of G.M.R. for capacitance calculation. **[4]**

b) Derive expression for capacitance of a single phase overhead line. **[6]**

c) A 3-phase, 50 Hz, 66kV overhead line conductors are placed in horizontal line. The conductor diameter is 1.25 cm. If the line length is 100km, Calculate capacitance per phase. **[8]**

Q7) a) Classify transmission lines based on length and voltage levels. **[3]**

b) Obtain the relationship between sending end voltage and current in terms of rcceiving end voltage and current for a medium transmission line using 'nominal T' method. Draw a neat phasor diagram. **[6]**

c) A 3-phase, 50 Hz, 150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 Ω 0.5 Ω and 3 X 10-6 per km per phase. If the line delivers 50 MW at 110kV and 0.8 p.f. lagging, determine the sending end voltage and current. Assume a nominal π circuit for the line. **[8]**

OR

Q8) a) State and explain in short Ferranti effect? **[3]**

b) Derive an expression for ABCD constants of short transmission 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 6 Ω. Respectively. Determine i) sending end voltage ii) percentage regulation iii) transmission efficiency. **[8]**