Total No. of Questions : 8]

SEAT No. :

P-1502

[Total No. of Pages : 3

[6002]-130
S.E. (Electrical)
POWER SYSTEM - I
(2019 Pattern) (Semester - IV) (203145)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***

Q1) a) Define term 'Sag' and explain factors affecting sag of transmission line. **[5]**

b) With neat diagram, explain construction and application of any two of the following type of insulators. i) Pin Type Insulator ii) Strain type insulator. Write application of each type of insulator. **[8]**

c) The weight of the overhead line conductor is 600 kg/km. The ultimate strength is 3000 kg. If the safety factor is 2. Find i) Sag ii) Height above which conductor should be supported if ground clearance required is 6 meters. **[5]**

OR

Q2) a) Derive an expression for sag in case of overhead transmission line when the supports are at unequal level. Explain the meaning of every term in derivation. Draw a neat diagram. **[6]**

b) How wind and ice loading affect the presence of sag. **[6]**

c) A string of suspension insulators consists of four units. The capacitance between each link and earth is one tenth of the self-capacitance of a unit. The voltage between line conductor and earth is 100 kV. Find i) Voltage distribution across each unit ii) String efficiency. **[6]**

Q3) a) Derive an expression for internal and external flux linkages of a conductor caring current 'I' ampere. **[8]**

b) Explain the concept of Geometric mean radius (GMR) or self GMR in case of transmission lines. **[4]**

c) A 50 Hz, overhead transmission line consisting of three conductors each of diameter 1.24 centimeter and spaced 2 meters apart. Calculate the inductance per phase per kilometer when conductors are equilateral spacing. **[5]**

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OR

Q4) a) Derive an expression for inductance of three phase transmission line with symmetrical spacing. Draw a neat diagram. **[7]**

b) Write a short note on proximity effect. **[4]**

c) A three phase 50 Hz overhead transmission line consist of three conductors each of diameter 0.3 centimeter. The spacing between the conductors are as follows. Between A and B = 4 meter, B and C = 4.5 meter and between A and C = 5.2 meter. Find inductance and inductive reactance per phase per kilometer of line. **[6]**

Q5) a) Derive the expression for capacitance to neutral of a single-phase transmission line considering effect of earth. **[8]**

b) A single-phase transmission line has two parallel conductors 3 meter apart, radius of each conductor is 1 centimeter. Calculate capacitance of line per kilometer. **[5]**

c) What is the difference in calculation of self GMD or GMR of inductance and capacitance? **[5]**

OR

Q6) a) Derive an expression for line to neutral capacitance of three phase overhead line with unsymmetrical spacing of conductors. Assume complete transposition of conductors. Draw a neat transposition diagram. **[8]**

b) A three phase, 110 kV, 50 Hz overhead line conductors are placed in a horizontal plane. The conductor diameter is 1.5 centimeter if line length is 120 kilometers, assume completer transposition of line. Calculate i) Capacitance per phase ii) Charging current. **[8]**

c) Define term electric potential. **[2]**

Q7) a) Give classification of transmission line with voltage, length, and line parameters. **[5]**

b) A balanced three phase load of 30 MW is supplied at 132 kV, 50 Hz and 0.85 power factor lagging by means of transmission line. The series impedance of single conductor is (20+j 52) ohm and total phase to neural admittance is $315*10^{-6}$ Siemens. Using nominal "T" method determine A, B, C and D constants of the line. Write units of each constant. **[7]**

c) With a neat circuit diagram, derive an expression for A, B, C and D constants of short transmission line. Draw a neat phasor diagram. **[5]**

OR

Q8) a) 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. **[7]**

b) A single-phase overhead transmission line delivers 2000 kW at 33 kV at 0.85 power factor lagging. The total resistance and inductive reactance of the line are 10 ohm and 15 ohms respectively. Determine i) Sending end voltage ii) Sending end power factor iii) Transmission efficiency. **[6]**

c) Write a short note on Ferranti effect. **[4]**

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