Total No. of Questions : 8]

SEAT No. :

PC2787

[Total No. of Pages : 3

[6352]-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 Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
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) Define string efficiency. Derive the expression for string efficiency of a suspension insulator consisting of three discs. **[6]**

b) An overhead transmission line conductor having a parabolic configuration. weighs 1.925 kg per metre of length. The area of X-section of the conductor is 2.2 cm^2 and the ultimate strength is 8000 kg/cm^2 .The supports are 600 m apart having 15 m difference of levels. Calculate the sag from the taller of the two supports which must be allowed so that the factor of safety shall be 5. Assume that ice load is 1 kg per metre run and there is no wind pressure.

c) Write a short note on: **[6]**

i) Pin type insulator

ii) Suspension type insulator

OR

Q2) a) An insulator string consists of three units, each having a safe working voltage of 15 kV. 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. **[6]**

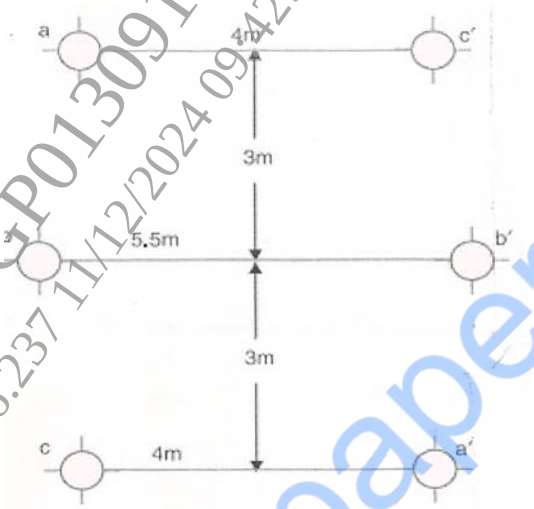
b) Derive an expression for sag in case of overhead transmission line when the supports are at unequal level. **[6]**

c) Explain various methods of improving string efficiency. **[6]**

P.T.O.

Q3) a) Derive an expression for inductance of three phase transmission line with symmetrical spacing. Draw a neat diagram. **[5]**

b) Find the inductance per phase per km of double circuit 3-phase line shown in Fig. The conductors are transposed and are of radius 0.75 cm each. The phase sequence is ABC. **[7]**



c) Write a short note on. **[5]**

i) Skin effect.

ii) Proximity effect.

OR

Q4) a) Explain the concept of GMD and GMR for inductance calculation. **[5]**

b) Derive the expression for inductance of single phase two wire line. **[7]**

c) The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2 m, 2.5 m and 4.5 m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm. **[5]**

Q5) a) 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. **[5]**

b) A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition. **[7]**

c) Derive the expression for capacitance to neutral of a three-phase line with equilateral spacing. Draw a neat diagram. **[5]**

OR

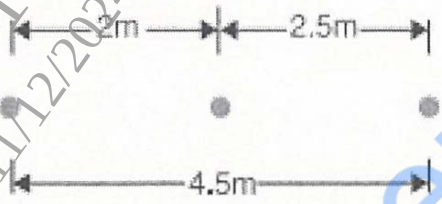
Q6) a) What do you understand by electric potential? Derive an expression for Electric potential at conductor in a group of charged conductors. **[5]**

b) 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 100 km, calculate. **[7]**

i) capacitance per phase

ii) charging current per phase

Assuming complete transposition of the line.



c) Derive the expression for capacitance of three phase overhead line considering unsymmetrical spacing. **[5]**

Q7) a) Derive an expression for ABCD constants of short transmission line. **[6]**

b) 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 : **[6]**

i) sending end voltage

ii) percentage regulation

iii) transmission efficiency.

c) Write a short note on Ferranti effect. **[6]**

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. **[6]**

b) Find the following for a single circuit transmission line delivering a load of 50 M VA at 110 kV and p.f. 0.8 lagging: **[6]**

i) Sending end voltage

ii) Sending end current

iii) Sending end power

iv) efficiency of transmission.

c) Given A = D = 0.98 ∠3°; B = 110 ∠75°ohm; C = 0.0005 ∠ 80°siemen. State and explain the classification of transmission line. **[6]**

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