

High Voltage Engineering

P. Pages : 2

Time : Three Hours



TKN/KS/16/7552

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Use of non programmable calculator is permitted.

1. a) "In Townsend's experiment the current growth characteristics has two different slopes." **6**
Elaborate the statement with necessary action ? And also define first and second ionization coefficients of Townsend's criteria.

b) A solid dielectric specimen of dielectric constant 4 has internal void of a thickness 1mm. The specimen is 1cm thick and it is subjected to voltage of 100 KV peak value. If the void is filled with air. **7**
 - i) Find whether an internal discharge can occur
 - ii) If Yes Find the voltage at which internal discharge start
 - iii) In order to avoid the internal discharge what would be the maximum operating voltage.

OR
2. a) Explain the factors which decides the dielectric strengths of transformer oil. **6**

b) What is Pachen's law justify the existence of two values of $[p \times d]$ corresponding to the same breakdown voltage in Pachen's curve. **7**

Determine $[p \times d]$ minimum and V_b minimum for Pachen's law if constant for air are $A = 15$, $B = 425$ and $r = 0.015$.
3. a) Explain the classification of lightning strokes according to their effect on power system. **6**

b) A transmission line tower has a resistance of 15Ω and inductance 30mH. Compute the surge voltage to which tower top is subjected if lightning stroke current is 35kA. Compute the % Reduction in overvoltage if tower resistance is reduced to 5Ω . **7**

Draw the electrical equivalent ckt. to explain the above phenomenon and waveform of lighting overvoltage.

OR
4. a) Explain clearly how the rating of L.A. is selected what is best location of L.A. and why ? **6**

b) What are the causes for switching and power frequency over voltages & how are they controlled in power system. **7**
5. a) Explain the behaviour of travelling waves with a voltage & current waveforms of open ended transmission line. **7**

- b) A long tailed unit function 500KV surge voltage on an overhead transmission line a surge impedance 400Ω arrives at a point where the line continues into a cable 1km long having a total inductance of $256\mu\text{H}$ and total capacitance of $0.165\mu\text{F}$. At the end of the cable a transformer is connected having surge impedance of 1000Ω . Find the surge voltage distribution 12 μsec . after the surge arrives at the line cable junction. **7**
- OR**
6. a) Explain the term "Attenuation and Distortion" of a travelling waves propagating on a overhead lines what is the effect of corona on the transmission line. **7**
- b) What is Bewley's lattice diagram. Explain its application. **7**
7. a) Explain how AC voltage is generated using resonant transformer What are its advantages & limitations. **6**
- b) An impulse generator has 8 stages with each condenser rated for $0.16\mu\text{F}$ and 125kV. This is the use to generate a standard switching impulse to first an object having a capacitance of 1 nF. The charging voltage is 120 KV. **7**
- i) Find the series & damping resistance
- ii) Write the equation of surge being generated and find the maximum o/p voltage of the generator.
- iii) Compute the average rate of rise & decay of the voltage.
- iv) Compute the efficiency and gross energy.
- OR**
8. a) Explain the principle of electrostatic voltmeter with neat sketch. Also write its advantages & limitations. **6**
- b) Explain the principle of Cockcraft - Walton voltage multiplier circuit used for generation of high D. C Voltage write its advantage & disadvantage. **7**
9. a) Explain sphere gap method for measurement of AC. What is the effect on nearby objects while measurement. **7**
- b) Explain peak reading voltmeter in detail with neat sketch and also write its advantages & limitations. **6**
- OR**
10. a) Explain the principle, construction and working of generating voltmeter. Enumerate its advantages & limitations. **8**
- A generating voltmeter has to be design so that if can have a range of 20KV to 400KV D.C. if the indicating meters reads minimum $2\mu\text{A}$. What should be the capacitance of the generator. What should be the upper range of meter assume driving motor is synchronous motor with speed of 1500rpm.
- b) Explain the measurement of high A.C. Voltage by capacitance voltage transformer. **5**
11. a) Explain measurement of dielectric constant and loss factor by high voltage Schering Bridge. **7**
- b) Explain in details the partial discharge phenomenon. **7**
- OR**
12. a) What is the significance of Non-destructive testing. What are the different non destructive test performed on insulation. Explain the importance of each test. **7**
- b) What is the purpose of high voltage testing. What are the advantages & drawbacks. **4**
- c) What are the different high voltage test performed on transformer bushings. **3**
