Reg. No. :

Question Paper Code : X10406

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Seventh Semester
Electrical and Electronics Engineering
EE8701 – HIGH VOLTAGE ENGINEERING
(Regulations 2017)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions

PART – A   (10×2=20 Marks)

1. Draw the mathematical model for lightning discharge.

2. What is meant by corona ?

3. What are the factors which affect the breakdown voltage of a gaseous dielectrics ?

4. What are the insulating materials used in power transformer ?

5. Mention the specifications of impulse current as per Indian Standards.

6. What are the advantages of high frequency transformers for generating high AC voltage ?

7. Why are the capacitive voltage dividers preferred for high AC voltage measurements ?

8. What are the requirements of digital storage oscilloscope for impulse and high frequency measurements ?

9. What is Basic Impulse Insulation Level ?

10. How is salt-fog test conducted on insulators ?

PART – B   **(5×13=65 Marks)**

11. a) i) Explain the two theories of charge formation in a thunderclouds. **(7)**

     ii) Explain the techniques to be used for controlling the switching over voltages in a power system. **(6)**

(OR)

  b) i) What are the requirements of a ground wire for protection of transmission line against direct lightning stroke ? Explain how they are achieved in practice. **(7)**

     ii) Describe the various steps to draw the Bewley-Lattice diagram of successive reflections. **(6)**

12. a) i) State and explain Paschen's law. How do your account for the minimum voltage for breakdown under a given (pd) condition ? **(7)**

     ii) Explain the breakdown due to 'treeing' and 'tracking' process in a solid insulating materials. **(6)**

(OR)

  b) i) Explain any two theories which explains breakdown in commercial liquid dielectrics. **(7)**

     ii) Illustrate the field emission theory of breakdown mechanism in vacuum dielectrics. **(6)**

13. a) i) With a neat sketch, explain the construction and working of a Van de Graff generator. **(7)**

     ii) Why is controlled tripping necessary in impulse generators ? Discuss how is it performed using Trigatron gap ? **(6)**

(OR)

  b) i) From the basic Marx circuit develop the modern multistage impulse generator circuits and explain the significance of its various parameters. **(7)**

     ii) With a neat circuit diagram, explain any one method of generating switching surges in HV laboratory. **(6)**

14. a) i) Explain with neat diagram, the working principle and operation of an electrostatic voltmeter for measuring high voltages. **(7)**

     ii) Explain the operation of a series capacitance voltmeter to measure high AC voltages. **(6)**

(OR)

  b) i) What are the different type of resistive shunt used for impulse current measurements ? Discuss their characteristics and limitations. **(7)**

     ii) Discuss the detailed procedure for measuring peak value of very high DC, AC and impulse voltages using standard sphere gaps. **(6)**

15. a) Explain in details about the procedure for conducting power frequency, impulse voltage and thermal tests on high voltage bushings. **(13)**

(OR)

b) Explain in details about the procedure for conducting dielectric, impulse voltage and short circuit current tests on high voltage circuit breakers. **(13)**

PART – C   **(1×15=15 Marks)**

16. a) A ten stage Cockcroft-Walton voltage multiplier circuit has all capacitors of 0.05 µF. The secondary voltage of the supply transformer is 120 kV at a frequency of 150 Hz. If the load current is 1.2 mA, determine the following i) voltage regulation, ii) percentage of ripple voltage, iii) the optimum number of stages for maximum output voltage, iv) the maximum output voltage.

(3+4+4+4)

(OR)

b) A 100 kVA, 250 V/200 kV feed transformer has resistance and reactance of 1% and 5% respectively. This transformer is used to test a cable at 400 kV at 50 Hz. The cable takes a charging current of 0.5 A at 400 kV. Determine the series inductance required. Assume 1% resistance of the inductor. Also determine input voltage to the transformer. Neglect dielectric loss of the cable. **(15)**

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