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Question Paper Code: 46303

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Electrical and Electronics Engineering

14UEE603 – HIGH VOLTAGE ENGINEERING

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Corona effect can be identified by

- (a) bushy sparks (b) faint violet glow
(c) red light (d) arcing between conductors and earth

2. The equivalent circuit of a surge arrester may be represented as

- (a) Capacitor (b) An inductor (c) Non-linear resistor (d) Resistor

3. Which of the following liquids has highest breakdown strength?

- (a) Mineral oils (b) Silicone oils
(c) Chlorinated hydrocarbon oils (d) Polyolefins or esters

4. Breakdown is permanent in

- (a) Gases (b) Liquids (c) Solids (d) All the three

5. A Van de Graaff generator has a belt speed of 2.5 m/s, charge density of $10 \mu\text{C}/\text{m}^2$ and a belt width of 2 m. The maximum charging current is

- (a) $50 \mu\text{A}$ (b) $5 \mu\text{A}$ (c) $2 \mu\text{A}$ (d) $12.5 \mu\text{A}$

6. A trigetron gap is used with
- (a) Cascade transformer units (b) Impulse current generator
(c) Impulse voltage generator (d) DC voltage double units
7. Sphere gaps are used to measure
- (a) DC voltages (b) AC peak voltages
(c) DC, AC peak & impulse voltages (d) only DC & AC peak voltages
8. The type of measuring device preferred for measurement of impulse currents of short duration is
- (a) Park's tubular shunt (b) current transformer
(c) Hall generator (d) Faraday ammeter
9. In wet flashover tests, the conductivity of water used is
- (a) $10 \pm 1.5 \mu$ Siemens (b) $100 \pm 15 \mu$ Siemens at ambient temperature
(c) $45 \pm 10 \mu$ Siemens at room temperature (d) $< 1.0 \mu$ Siemens at 27°C
10. The maximum voltage gradient at the ground level due to a charged cloud before lightning strikes, can be as high as
- (a) 1 V/cm (b) 30V/cm (c) 30V/cm (d) 300V/cm

PART - B (5 x 2 = 10 Marks)

11. What are switching over voltages?
12. What are commercial liquid dielectrics? How are they different from pure liquid dielectrics?
13. Define rise time.
14. What is the principle of electrostatic voltmeter?
15. Define creepage distance.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) State the characteristics of switching surges. (4)
(ii) What is a surge arrester? Explain its function as a shunt protective device. (8)

Or

- (b) Explain with suitable figures the principle and functioning of expulsion gaps and protector tubes. (16)

17. (a) Define Townsend's first and second ionization co-efficients. How is the condition for breakdown obtained in a Townsend discharge? (16)

Or

- (b) (i) How does an 'internal discharge' phenomenon lead to breakdown in solid dielectrics? (8)
(ii) Discuss the electrical properties that determine the dielectric performance of liquid dielectrics. (8)
18. (a) (i) Describe with neat sketch, the working of a Van de Graff generator. State its advantages and disadvantages. (12)
(ii) Define front and tail times of an impulse wave. What are the tolerances allowed as per the specifications? (4)

Or

- (b) (i) A Cockcroft-Walton type voltage multiplier has eight stages with capacitances, all equal to $0.05\mu\text{F}$. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5mA, find (a) the percentage ripple (b) the regulation (c) the optimum number of stages for minimum regulation or voltage drop. (9)
(ii) What is Tesla coil? How are damped high-frequency oscillations obtained from Tesla coil? (7)
19. (a) Explain how sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltage measurement? (16)

Or

- (b) (i) Explain with a neat sketch, how hall effect principle is used in measuring High direct currents. (8)
- (ii) Explain how high impulse currents are measured using resistive shunts with a neat circuit. Also discuss how resistance shunts are designed to reduce stray effects. (8)
20. (a) (i) What are the different power frequency tests done on insulators? Mention the procedure for testing. (8)
- (ii) Explain the different aspects of insulation design and insulation co-ordination adopted for EHV systems. (8)

Or

- (b) Discuss various tests carried out in a circuit breaker at the labs. (16)