Code No: 155BR **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023

HIGH VOLTAGE ENGINEERING

(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) What will the breakdown strength of air be for small gaps (1 mm) and large gaps (20 cm) under uniform field conditions and standard atmospheric conditions? [2]

b) What are the factors that influence conduction in pure liquid dielectrics and in commercial liquid dielectrics? [3]

c) What is a Tesla Coil? And write its applications. [2]

d) A 16-stage impulse voltage generator has stage capacitance of 0.125 μF and a charging voltage of 200 kV. What is the energy rating (in kJ)? [3]

e) Explain the conditions to be satisfied by a potential divider to be used for impulse voltage measurements. [2]

f) Define i) dielectric constant and ii) loss factor. [3]

g) What are the practical characteristics of a surge diverter? [2]

h) What is the mechanism of lightning strokes? [3]

i) What do you mean by (i) Chopped impulses and (ii) withstand voltage. [2]

j) What are the different tests to be conducted on circuit breakers? [3]

PART – B

(50 Marks)

2.a) How do the temperature and moisture affect the breakdown strength of solid dielectrics?

b) In a certain experiment relating to study of breakdown in gases, the ratio of current obtained to initial current was 1.20, 1.80 and 2.25 for gap distances of 1.0, 3.0 and 4.0 cm respectively if E/p was constant at 160 V/cm-torr and pressure 0.1 torr, calculate the value of α and γ. [5+5]

OR

3.a) Define Townsend's first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend discharge?

b) How does the 'internal discharge' phenomena lead to breakdown in solid dielectrics? [5+5]

4.a) Describe, with a neat sketch, the working of a Van de Graaff generator. What are the factors that limit the maximum voltage obtained?

b) An impulse generator has eight stages with each condenser rated for 0.16 μF and 125 kV. The load capacitor available is 1000pF. Find the series resistance and the damping resistance needed to produce 1.2/50 μs impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120 kV? [5+5]

OR

5.a) Give different circuits that produce impulse waves explaining clearly their relative merits and demerits.

b) Explain the cascading of transformers to generate high A.C. Voltages. [5+5]

6. Discuss the different methods of measuring high dc voltages. What are the limitations in each method? [10]

OR

7.a) What are the different types of resistive shunts used for impulse current measurements? Discuss their characteristics and limitations.

b) Explain with schematic diagrams how dc current can be measured? [5+5]

8.a) What are the different methods employed for lightning protection of overhead lines?

b) Explain the importance of switching over voltages in EHV power systems. How is protection against over voltages achieved? [5+5]

OR

9.a) Give the mathematical models for lightning discharges and explain them.

b) What is a surge arrester? Explain its function as a shunt protective device. [5+5]

10.a) What are the significances of power factor tests and partial discharge tests on bushings? How are they conducted in the laboratory?

b) Mention the different electrical tests done on isolators. [5+5]

OR

11.a) Explain the partial discharge tests on high-voltage cables. How is a fault in the insulation located in this test?

b) Why is grounding very important in an HV laboratory? Describe a typical grounding system used. [5+5]

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