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Code No: 155BR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January - 2025

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) State insulating materials used in rotating machines. [2]
b) Give the application of gases and gas mixtures as insulating medium in high voltage switchgear and high voltage power cables. [3]
c) What are the applications of high voltages? [2]
d) What are the methods to generate High alternating voltages? [3]
e) Explain the conditions to be satisfied by a potential divider to be used for impulse voltage measurements. [2]
f) What are the methods to measure high frequency ac voltages and impulse voltages? [3]
g) What are the origins of switching surges? [2]
h) What are the causes of over voltages in a power system? [3]
i) Define Fifty Percent Flashover voltage. [2]
j) What are the atmosphere correction factor and mention their influence in high voltage testing? [3]

PART – B

(50 Marks)

2.a) What is Ionization process? Explain different ionization process in detail.
b) What is thermal breakdown in solid dielectrics, and how is it practically more significant than other mechanics? [5+5]

OR

3.a) Explain streamer theory breakdown in gases.
b) Explain different theories of breakdown in pure and commercial liquids. [5+5]

4.a) Explain different methods to produce high D.C voltages. Also, give their advantages and disadvantages.
b) Draw the Marx circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances? [5+5]

OR

5. Explain the different methods of producing switching impulses in test laboratories. [10]

6.a) How would you describe the cathode ray oscillographs used to measure impulsive voltage?

b) Following measurements are made to determine the dielectric constant and complex permittivity of a test specimen:
The air capacitance of the electrode system = 60 pF
The capacitance and loss angle of the electrodes with specimen = 180 pF and 0.0085 respectively. [5+5]

OR

7.a) Explain how a sphere gap can be used to measure the peak value of voltages, and illustrate it with a neat sketch. What are the parameters and factors that influence such voltage measurement?

b) An electrostatic voltmeter has an effective plate diameter of 50cm with a gap separation of 30cm. Find the force between the plates when measuring a dc voltage of 100kV. What is the maximum voltage that can be measured if the electric field E is to be not more than 5 kV/cm? [6+4]

8.a) How would you differentiate between a stepped leader and a dart leader?

b) Write detailed notes on surge arresters along with their general characteristics. [5+5]

OR

9.a) What are the mechanisms by which lightning strokes develop and induce over voltages on Overhead power lines?

b) What are the reasons for power frequency over voltages in an electrical power system? [5+5]

10.a) Explain the reasons for conducting wet tests on high voltage apparatus and give the specifications of the water used for wet tests.

b) What are the main facilities should be available in high voltage laboratory? And also explain the classification of high voltage laboratories? [5+5]

OR

11.a) Discuss the different high voltage tests conducted on bushings.

b) Elaborately discuss about various types of standards for HV testing of electrical power apparatus. [5+5]

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