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Name.....................
Reg. No...................

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

PTEE 2K 504C / EE 2K 506C – HIGH VOLTAGE ENGINEERING

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Define uniform and non-uniform fields and give example for each.

(b) Define the following as applied to high voltage break down :

(i) Internal and external insulation ; (ii) Flash over.

(c) Explain the superiority of cascaded transformer over two winding transformers used for generation of high A.C. voltages.

(d) An impulse generator has 10 stages with capacitors rated 0.15 μF and 150 kV per stage. The load capacitor is 1000 PF. Find the front and tail resistance to produce an impulse, if 1.2 / 50 μs.

(e) What is the need for generating high impulse currents?

(f) Compare the measurement of very high voltages using potential dividers and standard sphere gaps.

(g) What are atmospheric correction factors and mention their influence in high voltage testing?

(h) Explain the role of Bureau of Indian Standards in high voltage testing.

(8 × 5 = 40 marks)

II. (a) State the criteria for sparking potential and hence obtain the relation between sparking potential and (pd) values (Paschen's Law). Discuss on the nature of variation of sparking potential with (pd) values.

(15 marks)

Or

(b) (i) State why the very high intrinsic strength of solid dielectrics is not fully realized in practice. Discuss in detail any *one* mechanism of break down in solid dielectrics.

(12 marks)

(ii) Name some of the important practical solid dielectrics and mention their dielectric properties.

(3 marks)

III. (a) (i) Explain the need for generating high DC voltages.

(3 marks)

(ii) Draw the circuit of an *n*-stage Cockcroft-Walton circuit for generating very high DC voltages and explain its operation. Also derive an expression for the ripple content in the output waveform.

(12 marks)

Or

Turn over

(b) (i) Starting from the basic "Marx" circuit, develop the circuit of a modern multi-stage impulse generator and explain its operation. Discuss on the significance of various parameters.

(10 marks)

(ii) Explain tripping of impulse generators.

(5 marks)

IV. (a) (i) Explain why we resort to statistical approach for impulse studies.

(4 marks)

(ii) Define 50% impulse disruptive discharge voltage and discuss in detail any *one* method of obtaining the same.

(11 marks)

Or

(b) Explain the measurement of very high voltages using sphere gaps. Mention the merits and demerits of using sphere gaps.

(15 marks)

V. (a) (i) What are the needs for high voltage testing of electrical apparatus?

(5 marks)

(ii) Discuss in detail the power frequency voltage test withstand on a 66 kV porcelain insulator.

(10 marks)

Or

(b) (i) Explain the need for recording supplementary oscillograms during impulse testing of transformers.

(5 marks)

(ii) Give the detailed procedure for impulse voltage withstand test on a 500 kVA, 11 kV / 415 V, delta/star distribution transformer.

(10 marks)

[4 × 15 = 60 marks]