

Total No. of printed pages = 3

EE 1817 PE 31

Roll No. of candidate

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19/12/2021

BINA CHOWDHURY CENTRAL LIBRARY  
in IIT & IIS  
32/34 Hukri Nagar  
in Mahanagar

B.Tech. 7<sup>th</sup> Semester End-Term Examination

EE

HIGH VOLTAGE ENGINEERING (R)

(New Regulation w.e.f 2017-18) &

(New Syllabus w.e.f 2018-19)

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No.1 and any ~~5~~ from the rest

1. Fill up the blanks:-

(10 × 1 = 10)

- (i) Treeing effect is encountered with \_\_\_\_\_ voltage.
- (ii) In solid dielectrics \_\_\_\_\_ and \_\_\_\_\_ gradually leads to electrochemical deterioration and breakdown.
- (iii) The shape of the electrodes in an electrostatic voltmeter is \_\_\_\_\_ in nature.
- (iv) Spark gaps arrangement is generally used to measure \_\_\_\_\_ value of high voltage.
- (v) \_\_\_\_\_ is an example of a high frequency resonant transformer.
- (vi) In generating voltmeters the \_\_\_\_\_ is avoided.
- (vii) CVT stands for \_\_\_\_\_
- (viii) Polar dielectrics are normally used for \_\_\_\_\_
- (ix) Treeing phenomenon is observed in \_\_\_\_\_
- (x) Van de Graff generators are useful for \_\_\_\_\_

[Turn over



2. (a) What are the different ways of classifying voltage? (5+5+5=15)

OR

(b) What are the different configurations of the impulse generator circuit?

(c) What is Townsend's coefficient? Find the expression of 1<sup>st</sup> coefficient of Townsend.

OR

(d) Explain the method of finding the second coefficient of Townsend.

(e) What are the different devices of measuring high voltage? Write a line or two on each device.

3. (a) Illustrate and explain the working principle of a high voltage schering bridge. (3+7=10)

(b) Why the middle portion of the V-I characteristic curve of Townsend's experiment flat? (5)

4. (a) Why Electrostatic voltmeters are preferred over capacitive voltage divider circuit for measuring high voltages? (5+5+5=15)

(b) Why a cascaded transformer circuit preferred over a single unit of a very high transformer?

(c) What is the utility of a delay cable?

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5. (a) Give the expression for the force that exists between the electrodes of an electrostatic voltmeter and explain the different parameters involved. (2+6+5+2=15)

(b) What are the different secondary mechanisms due to which electrons are generated during the ionization process?

(c) With a neat illustration explain the streamer mechanism of spark breakdown.

(d) Explain the treeing and tracking mechanism with illustrations.

6. (a) Explain the working principle of a high frequency resonant transformer circuit. (5+5+5=15)

OR

(b) What are the disadvantages for which the Marx circuit was proposed to overcome? Explain how these disadvantages were nullified in a Marx circuit.



(c) Write a note on the different tests that are performed on an insulator.

OR

(d) Explain the working principle of a capacitive divider circuit for high voltage measurement purpose.

(e) Explain the working principle of a Cockcroft-Walton voltage multiplier circuit in the light of voltage doubler circuit.

7. (a) Explain the different mechanisms of breakdown in a liquid dielectric. (5+5+5=15)

(b) Briefly explain the breakdown mechanism in solid dielectric.

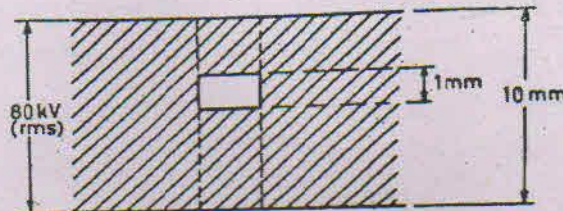
(c) Explain the working of a set up for the measurement of peak value of a High Voltage signal.

8. (a) A 5KV (RMS) is applied across two electrodes which are placed at 5mm apart in oxygen gas. The steady current flowing was found to be  $6 \mu\text{A}$ . When the spacing was changed to 7mm, the value of the current became  $8 \mu\text{A}$ . Find the value of the 1<sup>st</sup> Townsend coefficient. (8+7=15)

(b) Write a note on the earthing and safety measures to be taken for the connections in a High Voltage laboratory.

OR

(c)



As shown in the figure above a solid dielectric of dielectric constant 3 has an internal void of thickness 1mm. The specimen is 1cm thick and is subjected to a voltage of 80KV (RMS). If the void is filled with air find the voltage at which internal discharge will occur.