



Minoufiya University  
Faculty of Engineering  
Shebin El-Kom  
Department of Electrical Engineering

Diploma of Electrical Power Engineering  
1<sup>st</sup> Year  
Subject: High Voltage  
Time Allowed: Three Hours  
Date: 22/01/2014

- 1- a-) Explain how Schering bridge can be used for measuring the capacitance and loss angle of a capacitor
- 1- b-) A capacitor is made up of two parallel plates 4.5 cm apart. There are three sheets of dielectric each 1.5 cm thick between them. The permittivities of the sheets are 2, 3 and 4 respectively. Find in what proportion the voltage across the plates can be reduced in order that the charge in the capacitor shall be the same as it would be with air as a dielectric. Show how the dielectric stress is distributed.
- 1- c-) Describe the various factors that influence breakdown in a gas.
- 2- a-) Discuss the Townsend's current growth equations in the presence of primary and secondary processes.
- 2- b-) How is the condition for breakdown obtained in a Townsend's discharge?
- 2- c-) The table below gives the following experimental data while studying the Townsend phenomenon in a gas.

$E_1 = 30 \text{ kv/cm}$	$\ln I/I_0 = 3.5$	$D = 3 \text{ mm}$
$E_2 = 15 \text{ kv/cm}$	$\ln I/I_0 = 1.7$	$D = 2.5 \text{ mm}$

Compute the values of Townsend's primary and secondary ionization coefficients if the maximum values measured during the experiment are:

$E_1 = 30 \text{ kv/cm}$	$I/I_0 = 6 \times 10^7$	$D = 6 \text{ mm}$
$E_2 = 15 \text{ kv/cm}$	$I/I_0 = 2.5 \times 10^7$	$D = 6 \text{ mm}$

3- a-) What are the factors that influence conduction and B. D. in pure liquid dielectrics.

3- b-) What is "thermal breakdown" in Solid dielectrics?

4- a-) Explain the different mechanisms by which breakdown occurs in solid dielectrics in practice.

4- b-) A solid specimen of dielectrics has a dielectrics constant of 4.2 and  $\tan \delta = 0.001$  at a frequency of 50HZ. If it is subjected to an alternating field of 50kv/cm. Calculate the heat generated in the specimen due to the dielectrics losses.

5- a-) Explain the generation of high dc voltage using rectifier circuits (half and full wave) and voltage doubler circuits (simple and cascaded).

5- b-) Explain the generation of high ac voltages using high voltage transformers.