

King Fahd University of Petroleum & Minerals
Electrical Engineering Department

EE 620: High Voltage Engineering
(First Semester 051)
Dr. Zakariya M Al-Hamouz

Final Exam
Jan. 22, 2006 (7:00 – 9:00) pm

Student Name:
ID #:

SELECT ANY FOUR QUESTIONS

Question #	Mark
1	/25
2	/25
3	/25
4	/25
5	/25
Total	/100

SELECT ANY FOUR QUESTIONS

Q1)

a- What is the difference between partial breakdown and full breakdown? Give an example for each.

b- Three measurements of the current between two parallel plates were 1.2, 1.82 and 2.2 times the value of the initiating photocurrent I_0 at distances 0.005, 0.01504, and 0.019 m, respectively. E/P and P were maintained constant during the measurements. Calculate:

- i) the first ionization coefficient,
- ii) the second ionization coefficient,
- iii) if E/P and P during measurements were 14,000 V/m.torr and 750 torr, determine the distance and voltage at which transition to a self sustained discharge takes place.

Q2)

A sphere of radius 0.5 cm is spaced 5 cm from an earthed plate in atmospheric air. The sphere is stressed by a voltage of 1 kV. Apply the method of successive imaging to evaluate the maximum electric stress. Terminate the imaging process at 2 image charges.

Q3)

Calculate the breakdown voltage of a gas filling a uniform field gap of 5 mm length:

a- using Townsend theory

b- using streamer theory and Raether

$$\gamma = 5 \times 10^{-2}$$

$$\alpha / p = 4,778 e^{-221p / E}$$

Q4)

A solid dielectric sample of dielectric constant (relative permittivity) of 4 shown in Figure 1, has an internal void of thickness of 1 mm. The sample is 1 cm thick and is subjected to a voltage of 80 kV. If the void is filled with air and if the breakdown strength of air can be taken as 30 kV/cm, find the voltage at which the void breaks down.

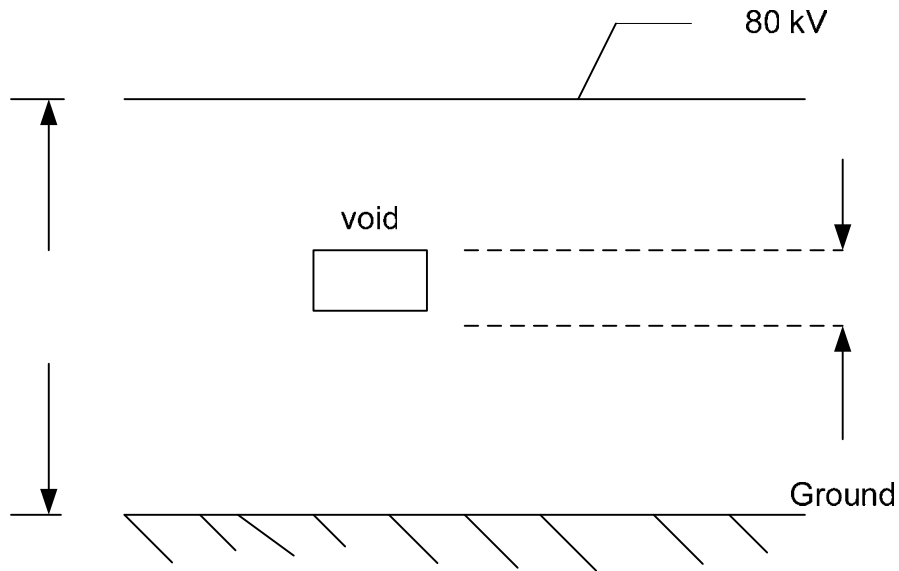


Figure 1

Q5)

For the co-axial geometry shown in Figure 2, calculate the potential at nodes 1, 2, and 3.

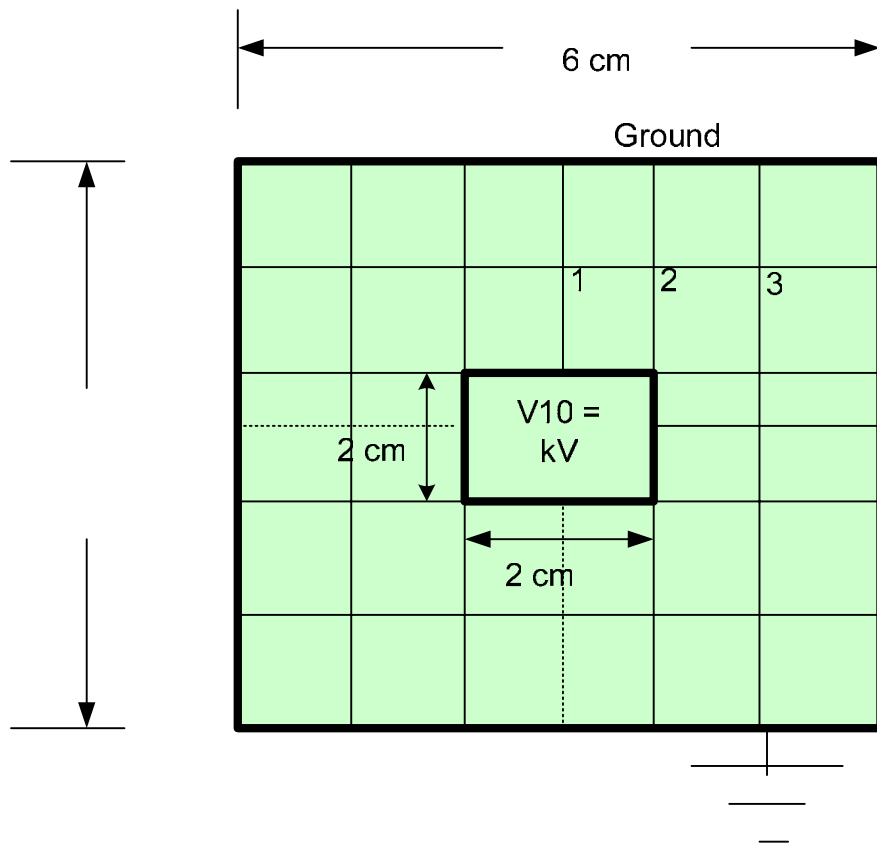


Figure 2