



Answer the following questions in allowed time of 1.5 hours

1- Give a short notes with drawings if available for each of the followings:

- a) The different types of electric field according to the electrode configuration and the importance of electric field computation in industrial applications.
- b) Post-breakdown phenomena and pre-breakdown phenomena in breakdown of gases.
- c) Townsend criterion of breakdown in electronegative and non-electronegative gases. And the criteria for avalanche to be started to developed in electronegative gases.
- d) The different factors which affect breakdown of gases.
- e) The breakdown strength in electronegative gases compared to that in other gases.
- f) The streamer theory of breakdown in gases.
- g) Practical considerations in using gases for insulation purposes. And give example for gases which possess most of these considerations.
- h) The difference between air insulated switchgear and gas insulated switchgear.

2- In an experiment in a certain gas it was found that the current between two Parallel plates were 1.22, 1.82 and 2.22 of the initiating photocurrent at distances 0.005, 0.01504 and 0.019 m respectively. E/P and P were maintained constant at 160 V/cm.torr, 0.1 torr respectively. **Calculate:**

- a) Townsend's primary ionization coefficient α .
- b) The secondary ionization coefficient γ .
- c) The ionization efficiency.
- d) The distance and the voltage at which transition to self sustained take place.

3- In a field where $\alpha = b - aX \text{ cm}^{-1}$, where X is measured from the cathode surface in cm and $a=10^4$ and $b=3.5 \cdot 10^3$.

- a) **Specify** the type of this field and give the reason.
- b) If an electron starts at a distance of 0.5 mm, **Find** the distance it must travel to produce an avalanche of 10^2 electrons.
- c) If $\alpha - \eta = a - b\sqrt{X} \text{ cm}^{-1}$, **Determine** the thickness of ionization zone.

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