

SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY, VIRUDHUNAGAR

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SHORT ANSWER QUESTIONS AND ANSWERS

EE 6701 –HIGH VOLTAGE ENGINEERING

UNIT – IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

PART-A

1. What are the general methods used for measurement of high frequency and impulse currents?

- (i) Potential dividers with a cathode ray oscillograph
- (ii) Peak voltmeters
- (iii) Sphere gaps

2. What are the high voltage d.c measurement techniques used?

- ↪ Series resistance micro ammeter
- ↪ Resistance potential divider
- ↪ Generating voltmeters
- ↪ Sphere and other spark gaps

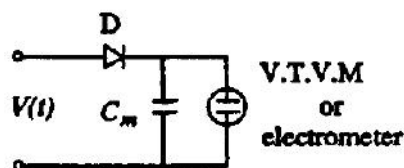
3. For what measurement are Hall generators normally used?

- ↪ Measurement of high direct currents
- ↪ Measurement of high frequency and impulse currents.

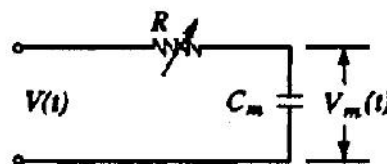
4. What are the types of measuring devices preferred for measurement of impulse currents of short duration?

- (i) Potential dividers with a cathode ray oscillograph
- (ii) Peak voltmeters
- (iii) Sphere gaps

5. Draw the simple circuit of peak reading voltmeter and it's equivalent.



(a) Basic circuit



(b) Equivalent circuit of (a)
(basic circuit)

6. List the factors that are influencing the peak voltage measurement using sphere gap.

- (i) Nearby earthed objects
- (ii) Atmospheric conditions and humidity
- (iii) Irradiation
- (iv) Polarity and rise time of voltage waveform.

7. What are the advantages of CVT measurement in HVAC?

- (i) Simple design and easy installation
- (ii) Can be used both as a voltage measuring device for meter and relaying purposes and also as a coupling condenser for power line carrier communication and relaying.
- (iii) Frequency independent voltage distribution along elements as against conventional magnetic potential transformers which require additional insulation design against surges.
- (iv) Provides isolation between the high voltage terminal and low voltage metering.

8. What are the limitations of generating voltmeter?

- ↪ Need calibration
- ↪ Careful construction is needed
- ↪ Any disturbances due to position and monitoring of the electrodes make the calibration invalid.

9. State the demerits of CVT measurement for HVAC measurements.

- ↪ Voltage ratio is susceptible to temperature variations.
- ↪ In the presence of capacitance, the problem of ferroresonance occurs in power system.

10. What are the methods available for measuring ac voltages of power frequency?

- (i) Series impedance ammeters
- (ii) Potential dividers
- (iii) Potential transformers
- (iv) Electrostatic voltmeters
- (v) Sphere gaps

11. What are the methods available for measuring dc current?

- (i) Resistive shunts with milli ammeter
- (ii) Hall effect generators
- (iii) Magnetic links

12. What is generating voltmeter?

A generating voltmeter is a variable capacitor electrostatic voltage generator which generates current proportional to the applied external voltage. The device is driven by an external synchronous or constant speed motor and does not absorb power or energy from the voltage measuring source.

13. What are the advantages and limitations of generating voltmeter?

Advantages:

- (i) No source loading by the meter
- (ii) No direct connection to high voltage electrode
- (iii) Scale is linear and extension of range is easy
- (iv) A very convenient instrument for electrostatic devices

Limitations:

- (i) They require calibration
- (ii) Careful construction is needed and is cumbersome instrument requiring an auxiliary drive
- (iii) Disturbance in position and mounting of the electrodes make the calibration invalid.

14. What are the sources that contribute to the error?

- (i) The effective value of the capacitance being different from the measured value of C.
- (ii) Imperfect rectifiers which allows small reverse currents
- (iii) Non-sinusoidal voltage waveforms with more than one peak or maxima per half cycle.
- (iv) Deviation of the frequency from that of the value used for calibration.

15. How resistance shunt is usually designed?

- (i) Bifilar flat strip design
- (ii) Coaxial tube or Park's shunt design
- (iii) Coaxial squirrel cage design.

16. What are the different techniques for impulse current measurement?

- (i) Rogowski coil
- (ii) Magnetic links
- (iii) Hall generators
- (iv) Faraday generator (v) Current transformer

17. What is hall voltage and hall coefficient?

If electric current flows through a metal plate located in a magnetic field perpendicular to it, Lorentz forces will deflect the electrons in the metal structure in a direction normal to the direction of both the current and the magnetic field. The charge displacement generates an emf in the normal direction, called the "Hall voltage". The Hall voltage is proportional to the current I , the magnetic flux density B and the reciprocal; of the plate thickness, the proportionality constant R is called the "Hall coefficient".

$$V_H = R (Bi / d)$$

PART-B

1. Explain measurements of very high voltages using sphere gaps. Mention merits and de merits of using sphere gaps& also explain digital peak voltmeter & rod gaps.
2. With a neat sketch explain the principle of operation of an electrostatic voltmeter for HVAC measurement. What are the merits and demerits?
3. Explain generating voltmeter for measuring high DC voltage.
4. What is CVT? Explain through phasor diagram how a tuned CVT can be used for HVAC measurement in substations. & also explain series capacitor peak voltmeter.
5. Explain the methods of measurement of high frequency current.
6. Explain the methods of measurement of high impulse current.

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