

- 4 Answer any two parts : 10×2=20
- (a) Explain the function of discharge device used in a power capacitor and explain the test for effectiveness of the capacitor.
- (b) What are the significances of power factor tests and partial discharge tests on bushings? How are they conducted in the laboratory?
- (c) Mention the different electrical tests done on isolators and circuit breakers. Explain in details.

- 5 Answer any three parts : $6\frac{2}{3} \times 3 = 20$
- (a) What are the mechanisms by which lightning strokes develop and induce overvoltages on overhead power lines?
- (b) A 500 kV , $2 \mu \text{ sec}$ rectangular wave travels on a line having a surge impedance of 350 ohm and approaches a termination with a capacitance of 300 pF . Determine the magnitudes of reflected and transmitted waves.
- (c) A 220 kV , 3-phase line has a horizontal configuration of conductors 5 meter apart. The ground clearance is 15 meter. Find the position and the number of ground wires required.
- (d) Explain the high voltage schering bridge for the $\tan \delta$ and capacitance measurement of insulators. Derive any expression if needed.
- (e) Explain how the volume resistivity of a solid dielectric is determined.



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0204Roll No. **B. Tech.****(SEM. VII) EXAMINATION, 2008-09
HIGH VOLTAGE ENGINEERING**

Time : 3 Hours]

[Total Marks : 100

Note : Answer all five questions.

- 1 Answer any four parts : 5×4=20

- (a) What are commercial liquid dielectrics and how are they different from pure liquid dielectrics?
- (b) In an experiment for determining the breakdown strength of transformer oil, the following observations were made. Determine the power law dependence between the gap spacing and applied voltage of the oil :

Gap spacing (mm):	4	6	10	12
Breakdown voltage (kV):	90	140	210	260

- (c) Derive the criterion for breakdown in electronegative gases.
- (d) What is Paschen's law? How do you account for the minimum voltages for breakdown under a given 'P × d' condition?



- (e) What is 'thermal breakdown' in solid dielectrics and how is it practically more significant than other mechanisms ?
- (f) Discuss the field emission theory of vacuum breakdown.

2 Answer any two parts :

10×2=20

- (a) What is the principle of operation of a resonant transformer ? How is it advantageous over the cascaded transformers ?

Determine the ripple voltage and regulation of a 10 stage Cockcraft Walton type dc voltage multiplier circuit having a stage capacitance = $0.01 \mu f$, supply voltage = $100 kV$ at a frequency of $400 Hz$ and a load current = $10 mA$.

- (b) Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications ?

A 12-stage impulse generator has capacitances each rated at $0.3 \mu f$, $150 kV$. The capacitance of the test specimen is $400 pF$. Determine the wave front and wave tail resistances to produce a $1/50 \mu sec$ impulse wave. Also determine the maximum output voltage if the charging voltage is $125 kV$.

- (c) Explain one method of controlled tripping of impulse generators. Why is controlled tripping necessary ?

3 Answer any two parts :

10×2=20

- (a) What are the conditions to be satisfied by a potential divider to be used for impulse work ?

A compensated resistance divider has its high voltage arm consisting of a series resistance whose total value is 25 kilo-ohms shunted by a capacitance of $400 pf$. The low-voltage arm has a resistance of $75 ohms$. Calculate the capacitance needed for the compensation of this divider.

- (b) Explain how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltage measurement ?
- (c) Differentiate between generating voltmeter and a normal voltmeter.

A generating voltmeter is to read $250 kV$ with an indicating meter having a range of $0-20 \mu A$ calibrated accordingly. Calculate the capacitance of the generating voltmeter when the driving motor rotates at a constant speed of $1500 rpm$.

