Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: High Voltage Engineering
Subject Code: 4TE06HVE1 Branch: B.Tech (EEE,EE)
Semester: 6 Date: 11/05/2016 Time: 2:30 To 5:30 Marks: 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

a) A Tesla coil is a
(1)cascaded transformer (2) coreless transformer (3) high frequency resonant transformer

b) Define: Glow discharge

c) Which of the following method or technique can be used for the measurement of high dc voltage?
(1) Generating voltmeter (2) Electrostatic voltmeter (3) Peak voltmeter

d) The essential condition for the Paschen's law to be valid is that
(1) voltage must be dc (2)voltage must be dc (3) temperature must be constant

e) In an impulse current generator the capacitor are connected in
(1)series (2) parallel (3) connected in series while charging and parallel while discharging

f) Transformer oil is
(1) Mineral oil (2) Silicon oil (3) polyester

g) Sphere gaps are used to measure
(1) dc voltages (2) ac peak voltages (3) dc, ac peak and impulse voltage

h) Corona discharge is
(1)Surface discharge (2)a spark between conductors (3) partial discharge around a high voltage conductor

i) The instrinsic breakdown strength of solid dielectrics is about
(1) 50 to 100 KV/mm (2) 500 to 1000 KV/mm (3) 5 to 10 KV/mm

j) A trigetron gap is used with
(1) cascade transformer units (2)impulse voltage generator (3) impulse current generator

k) According to the Stressed Oil Volume theory, the breakdown strength is
(1) Inversely proportional to the stressed oil volume (2) Directly proportional to the square of the stressed oil volume
(3) Directly proportional to the stressed oil volume

l) Loss of charge method is used to determine
(1)insulation resistance (2) dielectric constant (3) rate of charging of a capacitor

m) Most important tests conducted on isolators and circuit breakers are
(1)voltage withstand tests (2) short circuit tests (3) high current tests

n) Time to front of A impulse voltage wave form is defined as
(1)1.25 times the interval between 0.1to0.9 peak value (2) Time interval between 0.1 to 0.9 peak value (3) 1.67 times the interval between 0.1 to 0.9 peak of peak value

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(A) Define the Townsend first & second ionization co-efficient. Derive the equation for second ionization co-efficient $I = I0e^{\alpha d} / (1-\gamma (e^{\alpha d}- 1)$? **(7)**

(B) What is Vacuum? Discuss the various mechanisms of vacuum breakdown. **(7)**

Q-3 **Attempt all questions** **(14)**

(A) Why is a Cockcroft – Walton circuit preferred for voltage multiplier circuits? Explain its working with a schematic diagram. **(7)**

(B) What is Tesla coil? Draw the equivalent circuit and its output waveform. Derive the equation of output voltage. **(7)**

Q-4 **Attempt all questions** **(14)**

(A) For a High voltage d.c generator using Cockroft- Walton circuit with 8 stages and peak input a.c voltage of 125kV, 150Hz, the load current of 5mA and each stage capacitance of 0.05µF, calculate the ripple voltage and voltage drop. **(5)**

(B) State and explain Paschen's law with the help of characteristics curve. **(4)**

(C) What is a trigatron gap? Explain its function and operation. **(5)**

Q-5 **Attempt all questions** **(14)**

(A) Explain with neat diagram the principle of operation of an electrostatics Voltmeter. Discuss its advantages and limitations for high voltage measurements. **(7)**

(B) What is partial discharge? Explain partial discharge testing on cables. **(7)**

Q-6 **Attempt all questions** **(14)**

(A) An impulse generator has 8 stages with each condenser rated for 0.16 µF and 125 kV. The load capacitor available is 1000pF. Find the series resistance and damping resistance needed to produce 1.2/50µs impulse wave. What is the max output voltage of the generator, if the charging voltage is 120kV? **(7)**

(B) Discuss measurement of Dielectric Constant & Loss tangent of capacitor. Derive the equation for the same. **(7)**

Q-7 **Attempt all questions** **(14)**

(A) What is capacitance voltage transformer? Explain with phasor diagram how a tuned capacitance voltage transformer can be used for voltage measurements in power systems. **(7)**

	(B)	Explain the cascade and resonant transformer.	**(7)**
Q-8		**Attempt all questions**	**(14)**
	(A)	Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications?	**(5)**
	(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?	**(5)**
	(C)	A steady current of 400µA flows through the plane electrodes separated by a distance of 5mm when a voltage of 10kV is applied. Determine the Townsend's first ionization constant (coefficient) if a current of 50µA flows when the distance of separation is reduced to 1mm and the field is kept constant at previous value.	**(4)**