

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
B E Sem-VI Examination May 2011

Subject code: 160904
Date: 21/05/2011

Subject Name: High Voltage Engineering
Time: 10.30 am – 01.00 pm
Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Describe the current growth phenomenon in a gas subjected to uniform electric fields. What is Paschen's law? **07**
- (b) Describe, with a neat sketch the working of a Van de Graff generator. What are the factors that limit the maximum voltage obtained? **07**

- Q.2** (a) Explain the various theories that explain breakdown in commercial liquid dielectrics. **07**
- (b) Explain thermal breakdown in solid dielectrics. How this mechanism is more significant than the other mechanisms? **07**

OR

- (b) What are "Treeing" and "Tracking"? Explain clearly the two processes in solid dielectrics. **07**

- Q.3** (a) 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? **07**
- (b) What is meant by insulation co-ordination? How are the protective devices chosen for optimal insulation level in a power system? **07**

OR

- Q.3** (a) Explain the different electrical tests done on isolators and circuit breakers. **07**
- (b) A 12-stage impulse generator has 0.126 μF capacitors. The wave front and the wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load capacitor is 1000 pF, find the front and tail times of the impulse wave produced. **07**

- Q.4** (a) Explain the different schemes for cascade connection of transformers for producing very high a.c. voltages. **07**
- (b) What are partial discharges and how are they detected under power frequency operating conditions? **07**

OR

- Q.4** (a) Explain with neat diagram the principle of operation of an electrostatic voltmeter. Discuss its advantages and limitations for high voltage measurements. **07**
- (b) Determine the specific heat generated in the test specimen due to dielectric loss if the dielectric constant and loss angle of the specimen are 3.8 and 0.0085 respectively. The electric field is 40 KV/cm at 50 Hz. **07**

- Q.5 (a)** Discuss the different methods of measuring high d.c. voltages. What are the limitations in each method ? **07**
- (b)** What are the different types of resistive shunts used for impulse current measurements ? Discuss their characteristics and limitations. **07**

OR

- Q.5 (a)** What is the principle of operation of a resonant transformer ? How is it advantageous over the cascade connected transformers ? **07**
- (b)** Describe the construction, principle of operation and application of a multistage Marx's surge generator. **07**
