

B.E. ELECTRICAL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAMINATION, 2018

HIGH VOLATGE TECHNIQUE - I

Time: Three hours

Full Marks: 100

(50 marks for each part)

Use separate answer script for each part.

Part – I

Answer any three questions.

Two marks are reserved for neat and well organized answers.

- 1.a) State and explain Paschen's law. Explain the nature of Paschen's curve. 2+3
- 1.b) State the limitations of Townsend's theory. Comment on various time lags that may occur during breakdown of a gaseous dielectric. 3+3
- 1.c) Explain the process of electron emission by the bombardment of charged particles. 5
- 2.a) Explain the process of corona formation and break down of gaseous dielectric for a point to plane gap for the following two cases: 12
- i) Point electrode is negative and plane electrode is positive.
 - ii) Point electrode is positive and plane electrode is negative.
- 2.b) Deduce the expression for Paschen's minimum. 4
- 3.a) Explain the process of development ^{of} surface discharge in bushing. 10
- 3.b) Comment on the effect of placing a barrier between electrodes in non – uniform field. 6
4. Write short notes on (i) electro mechanical breakdown of solid dielectric material and (ii) breakdown of commercial liquids due to suspended particles. 8+8
5. State what you mean by partial discharge. Describe the phenomenon of partial discharge in the following two cases: 12+4
- i) Solid insulating material is subjected to ac application.
 - ii) Solid insulating material is subjected to dc application.

[Turn over

**BACHELOR OF ENGINEERING IN
ELECTRICAL ENGINEERING EXAMINATION, 2018
(4th Year, 1st Semester)
HIGH VOLTAGE TECHNIQUE I**

Time: Three Hours

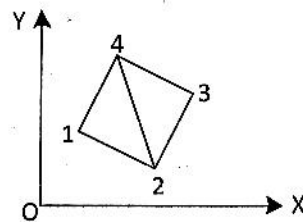
Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-IIAnswer *any three* questions*Two marks* are reserved for neat and well organized answer script

1. Justify the statement – “Presence of a dielectric particle can be detrimental to critical systems like GIL”. Derive suitable expressions in support of your justification. Assume either cylindrical or spherical impurity in uniform field distribution. 16
2. Show how FDM can be applied to high voltage systems to find out a nodal voltage. Assume 2D system with equal nodal distance. How acceleration of convergence by can be achieved? How the expression of nodal voltage is modified in the case of electrode or dielectric boundaries where nodal distances cannot be assumed to be equal? 16
3. With the help of FEM, solve the unknown potentials in Fig. 1. 16



Node	Coordinates	Node	Voltagess
1	(5, 10)	1	0
2	(15, 5)	3	10
3	(20, 15)		
4	(10, 20)		

Fig. 1.

4. a) Discuss about the method of electric field computation by Charge Simulation Method in multi-dielectric media. 8
- b) How accuracy is checked in Charge Simulation Method? 4
- c) Mention the factors affecting the accuracy in Charge Simulation Method. 4
5. Why it is essential to know the stress distribution in a high voltage system? With proper illustrations, show how stress control can be achieved in (i) circuit breakers, (ii) post insulators and (iii) bushings. 16