MASTER OF ELECTRICAL ENGINEERING Examination, 2017
(2nd Semester)

HIGH VOLTAGE FIELDS

Time: Three hours. **Full Marks: 100**

Answer any five questions.

1. a) For a 3-D system with unequal nodal distance derive the expression for potential of a node lying at the origin. 10

   b) Fig. 1 shows the arrangement for a parallel plate capacitor. Total sixteen nodes have been placed on the electrodes and in the region in between them respectively. All adjacent nodes are at equal distances from each other. Compute the values of potentials for nodes 6, 7, 10 and 11 respectively, up to second iterations. 10

2. a) Explain uniqueness theorem in connection with solution of Laplace or Poisson's equation. 8

   b) State how acceleration of convergence by over-relaxation is done. 8

   c) State the disadvantages of FDM. 4

3. a) Deduce the CSM equations in multi-dielectric media. 6

   b) Deduce the expressions for potential and field co- efficient for an infinite length line charge. 14

4. a) Discuss the method of 'region oriented charge simulation method.' 10

   b) Give a comparison between CSM and FEM. 10

5. a) Derive the FEM equations in the case of two dimensional fields. Also write the FEM equations in Multi-dielectric media. 14

b) Derive the FEM equations in axi-symmetric system. 6

6. a) Explain the method of conformal transformation. Also explain logarithmic transformation. 12

b) Explain how conformal transformation can be applied in the case of co-axial cables for finding electric field. 8

7. a) Derive the expression for pressure developed at the insulator-insulator boundary. 16

b) There is a paper insulated transformer coil immersed in oil. ε_r for paper = 3.5 and ε_r for oil = 2.5. There is a normal stress of 30kV/cm and a tangential stress of 10 kV/cm, just within paper. Calculate the pressure acting on the outer surface of the paper. 4

8. Write short notes on any two of the following: 10×2

i. Indirect boundary element method.
ii. A dielectric sphere in uniform field.
iii. Field calculation by CSM including surface resistances.

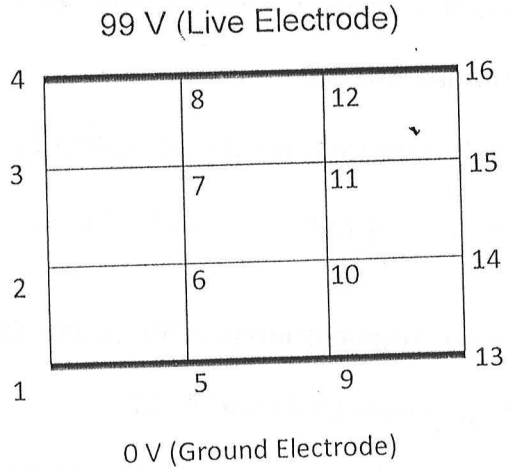

Fig. 1.