CRASH COURSE

USN ☐☐☐☐☐☐☐☐☐☐ 10EE73

Seventh Semester B.E. Degree Examination, May 2017
## High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. Enumerate the major applications of high voltages and their need for generation in laboratory. **(06 Marks)**
   b. Explain the process of ionization by collision and hence derive the current growth equation. **(10 Marks)**
   c. A steady current of 600 μA flows through the plane electrodes separated by a distance of 0.5cm when a voltage of 10KV is applied. Determine the Town send's first ionization coefficient if a current of 60μA flows when the distance of separation is reduced to 0.1cm and the field is kept constant at the previous value. **(04 Marks)**

2 a. Briefly write about Paschen's law and its significance. **(07 Marks)**
   b. Discuss the time lags of break down, with a diagram for step function voltage pulse. **(07 Marks)**
   c. Explain how breakdown occurs in liquid dielectrics due to cavitation and bubble theory. **(06 Marks)**

3 a. Write a note on electromechanical breakdown mechanism in solid dielectrics. **(07 Marks)**
   b. With aid of related heat gain loss curves and energy conservation equations, explain Thermal mechanism of breakdown in solid dielectrics. **(08 Marks)**
   c. An AC voltage of 60KV is applied between two parallel plates rounded at the edges and placed 2cm apart in air. A press board sheet of thickness 0.2cm is placed on the lower plate as shown in fig. Q3(c). Calculate the voltage across the air gap and the press board sheet. Given permittivity of press board = 4. **(05 Marks)**

Fig.Q3(c)
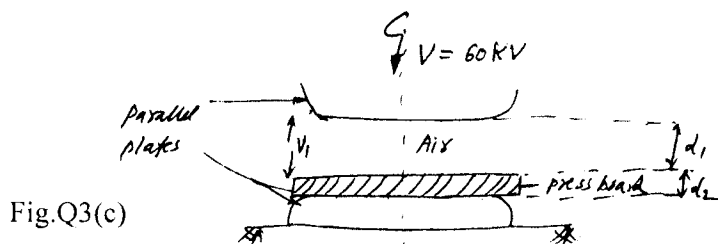
4 a. State the advantages of series resonant circuit over cascade connection. **(05 Marks)**
   b. Describe Tesla coil with its equivalent circuit and output waveform. Hence show that

   $$V_2 = V_1 \sqrt{\eta \frac{C_1}{C_2}}$$ with usual notations. **(09 Marks)**

   c. Three, 350 KV, 1 MVA testing transformers with 10% short circuit impedance are connected in cascade. Determine the short circuit current if flash over occurs when the transformers are excited to a voltage of 200 KV each. **(06 Marks)**

PART – B

5 a. Define Standard lightning impulse voltage wave with a neat sketch thereby mention its tolerance limits as specified by various international standards. **(04 Marks)**

   b. Explain triggering of impulse generator by using trigation gap circuit schematic. **(08 Marks)**

   c. A single stage impulse generator circuit has a stage capacitance of $0.1\mu F$. The wave front and wave tail resistances are 285Ω and 540Ω respectively. The capacitance of insulator to be tested is 1000pf. If the charging voltage is 100KV then determine
   i) Wave shape of impulse voltage wave (t1/t2)   ii) Peak value of the output impulse
   iii) Voltage efficiency of the generator.   Iv) Impulse generator energy rating.
   Given : $\alpha = 0.01813 \times 10^6$ and $\beta = 3.544 \times 10^6$. **(08 Marks)**

6 a. Explain the method of measuring HVDC using series resistance micro ammeter and hence write its limitations. **(08 Marks)**

   b. Describe Chubb and Forfescue method of measuring high AC peak voltages. **(08 Marks)**

   c. An absolute electrostatic has a movable circular plate of 8cms in diameter. If the distance between the plates during measurement is 4mm, determine the potential difference when the force of attraction is 0.2 gram weight. Given : 1 kg = 9.81N. **(04 Marks)**

7 a. Briefly explain the factors affecting measurement of voltages using standard sphere gap. **(10 Marks)**

   b. Describe the method of measuring capacitance and tans δ using HV Schering bridge. **(10 Marks)**

8 a. Why partial discharge tests are performed on High voltage cables? Explain the method of conducting these tests on cables. **(10 Marks)**

   b. Name and explain in brief different tests that are carried out on High voltage insulators. **(10 Marks)**

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