UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: High Voltage Engineering **Course code: PSEG 309**
Semester: 6th
Program: B.Tech (Electrical)
Time: 03 hrs. **Max. Marks: 100**

Instructions: Choices only in Question 7,8,9,10.

SECTION A

S. No.		Marks	CO
Q 1	A steady current of 400 μA flows through the plane electrode separated by a distance of 0.5 cm when a voltage of 10 kV is applied. Determine the Townsend's first ionization coefficient if a current of 60 μA flows when the distance of separation is reduced to 0.1 cm and the field is kept constant at the previous value.	**5**	**CO1**
Q 2	Explain liquid breakdown based on electroconvection	**5**	**CO1**
Q3	Discuss advantages and disadvantages of resonance transformer.	**5**	**CO2,3**
Q4	Discuss application and limitations of generating voltmeter.	**5**	**CO2,3**
	SECTION B (Choice in Question no.7 & 8)		
Q 5	Explain with neat diagram the principle of operation of an Electrostatic Voltmeter. Discuss its advantages and limitations for high voltage measurements.	**10**	**CO4**
Q6	Discuss and compare the performance of (i) resistance (ii) capacitance potential dividers for measurements.	**10**	**CO3**
Q7	An absolute electrostatic voltmeter has a movable circular plate 8 cms in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is $0.2*10^{-3}*9.8$ N	**10**	**CO3**
	OR		
Q7	An impulse generator has eight stages with each condenser rated for 0.16 micro F and 125 kV. The load capacitor available is 1000 pF. Find the series resistance and the damping resistance needed to produce 1.2/50 micro sec impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120 kV?	**10**	**CO3**
Q8	List out various tests to be carried out on a cable and give a brief discussion of each test.	**10**	**CO 3,4**
	OR		
Q8	Describe the construction, principle of operation and application of a multistage Marx's Surge Generator	**10**	**CO3,4**

SECTION-C (Choice in both questions)			
Q 9	A) An electrostatic voltmeter has two parallel plates. The movable plate is 10 cm in diameter. With 10 kV between the plates the pull is 5 × 10–3 N. Determine the change in capacitance for a movement of 1 mm of movable plate. B) A peak reading voltmeter is required to measure voltage up to 150 kV. The peak voltmeter uses an RC circuit, a micro ammeter and a capacitance potential divider. The potential divider has a ratio of 1200 : 1 and the micrometer can read up to 10 μA. Determine the value of R and C if the time constant of RC circuit is 8 secs.	**20**	**CO3,4**
	OR		
Q9	A) A Rogowski coil is required to measure impulse current of 8 kA having rate of change of current of 10^{10} A/sec. The voltmeter is connected across the integrating circuit, which reads 8 volts for full-scale deflection. The input to the integrating circuit is from the Rogowski Coil. Determine the mutual inductance of coil, Capacitance of the integrating circuit. ($R = 8 \times 10^3\ \Omega$) B) A 20 kV, 50 Hz Schering Bridge has a standard capacitance of 106 μF. In a test on a bakelite sheet balance was obtained with a capacitance of 0.35 μF in parallel with a non-inductive resistance of 318 ohms, the non-inductive resistance in the remaining arm of the bridge being 130 ohms. Determine the equivalent series resistance and capacitance and the p.f. of the specimen.	**20**	**CO3,4**
Q10	A) Draw a neat diagram of high voltage Schering Bridge and analyses for balanced condition including derivation for R and C & draw its phasor diagram for (i) Series equivalent (ii) Parallel equivalent representation of the insulating material.	**20**	**CO5**
	OR		
Q10	A) Describe various tests to be carried out on C.B. B) Discuss Rogowski Coil & Explain its principle of operation with diagram for measurement of high impulse currents.	**20**	**CO5**

Name: **Enrolment No:**	UPES