

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: BTECH.
BRANCH: EEE

SEMESTER: VII
SESSION : MO/2024

SUBJECT: EE593 HIGH VOLTAGE ENGINEERING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
- Normal Graph Paper Required
-

		CO	BL
Q.1(a)	Explain the two essential conditions to be satisfied for a collision of an electron with an atom to be an ionizing one.	[5] 1,3,4	4
Q.1(b)	How is the electric stress/ electric field intensity controlled?	[5] 1,3,4	3
Q.2(a)	What is Paschen's law? How do you account for the minimum voltage for a breakdown under a given 'p X d' condition?	[5] 1,3	4
Q.2(b)	What will be the breakdown voltage of a spark gap in gas at $p=760$ torr at 25°C if $A=15/\text{cm}$, $B=360/\text{cm}$, $d=1$ mm and $\gamma=1.5 \times 10^{-4}$?	[5] 1,3	3
Q.3(a)	How does the 'internal discharge' phenomena lead to a breakdown in solid dielectrics?	[5] 1,3,4	4
Q.3(b)	In an experiment to determine the breakdown strength of transformer oil, the following observations were made. Determine the power law dependence between the gap spacing and the applied voltage of the oil. Gas Spacing (mm) : 4 6 10 12 Voltage at breakdown (kV) : 90 140 210 255	[5] 1,2,5	3
Q.4(a)	A Tesla coil has a primary winding rated for 10 kV. If L_1 , L_2 and the coefficient of coupling K are 10 mH, 200 mH and 0.6, respectively, find the peak value of the output voltage of the capacitance on the primary side is 2.0 μF , and that on the secondary side is 1nF. Neglect the winding resistance.	[5] 1,2,5	3
Q.4(b)	What is CVT? Explain with a phasor diagram how a tuned capacitance-voltage transformer can be used for voltage measurements in power systems.	[5] 1,2,5	3
Q.5(a)	List the common test facilities available in high-voltage laboratories.	[5] 1,2	2
Q.5(b)	Why is grounding essential in an HV laboratory? Describe a typical grounding system used.	[5] 1,2	4

:20/11/2024:::M