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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech

Subject (Course): High Voltage Engineering

Course Code : PSEG 491

No. of page/s: 2

Semester – 7th

Max. Marks : 100

Duration : 3 Hrs

SECTION A

20 Marks

- 1) What measurement is Hall generator normally used for? [CO3]
- 2) Differentiate type test and routine test. [CO4]
- 3) Give the Indian standard reference atmospheric conditions for high voltage testing. [CO2]
- 4) Define the following as applied to disruptive voltage. [CO1]
 - a) Flashover voltage
 - b) Spark over voltage
- 5) Define Direct & indirect lightning stroke. [CO1]

SECTION B

40 Marks

- 6) Explain various theories of breakdown in solids in brief [CO1]
- 7) Draw & explain Marx circuit and modified Marx circuit of multistage impulse generator. Discuss differences between these two. [CO3]
- 8) Explain with neat diagram the principle of operation of an electrostatic voltmeter. Discuss its advantages and limitations for high voltage measurements [CO3]
- 9) [CO4,CO3]
Describe various tests to be carried out on Circuit Breaker. Discuss briefly

OR

- 9) A 10-stage cockraft-Walton circuit has all capacitors of $0.06 \mu\text{F}$. The secondary voltage of the supply transformer is 100KV at a frequency of 150 Hz. If the load current is 1 mA, Determine
 - (1) Voltage regulation
 - (2) Ripple voltage
 - (3) Optimum number of stages for maximum output voltage.

(4) Maximum output voltage.

SECTION C

40 Marks

10)

- a) 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 gm wt [CO3]

OR

10)

- a) Explain principle, working, advantages & disadvantages of Generating voltmeters

10)

- 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 A. Determine the value of R and C if the time constant of RC circuit is 8 secs

[CO3]

11)

- 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 R and C of the integrating circuit. [CO3]
- b) A 20 kV, 50 Hz Schering Bridge has a standard capacitance of 106 μ F. In a test on a bakelite sheet balance was obtained with a capacitance of 0.35 μ F 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 and determine the equivalent parallel resistance, capacitance and power factor of the rest specimen. [CO2,3]



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SECTION A

20 Marks

- 1) Distinguish between insulators and dielectrics and give examples for each. [CO1]
- 2) Explain some uses of HVDC [CO1]
- 3) Differentiate between type test and routine test. [CO4]
- 4) State the factors influencing the measurements using sphere gap [CO3]

SECTION B

40 Marks

- 5) Explain clearly various processes, which explain electric breakdown in liquid. [CO2]
- 6) Draw a typical impulse current generator circuit and explain its operation and application. [CO3]
- 7) Draw a simplified equivalent circuit of resistance potential divider and discuss it. [CO3]
- 8) What are test conducted on Bushings & Insulator? Explain in short. [CO4]

SECTION C

40 Marks

- 9)
 - a) A generating voltmeter is required to measure voltage between 15 kV to 250 kV. If the indicating meter reads a minimum current of $2 \mu\text{A}$ and maximum of $35 \mu\text{A}$, determine the capacitance of the generating voltmeter. Assume that the speed of driving synchronous motor is 1500 rpm. [CO3]
 - b) A peak reading voltmeter is required to measure voltage upto 150 kV. The peak voltmeter uses an RC circuit, a microammeter and a capacitance potential divider. The potential divider has a ratio of 1200 : 1 and the micrometer can read upto $10 \mu\text{A}$. Determine the value of R and C if the time constant of RC circuit is 8 secs. [CO3]
- 10).
 - a) 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 0.3 gm wt. [CO3]

- b) 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. [CO3]