Name:

Enrolment No:

UPES

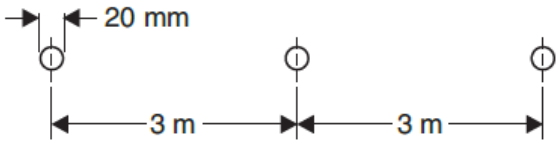
End Semester Examination, December 2023

Course: Power system -I **Semester: V**

Program: B.Tech. Electrical Engineering **Time : 03 hrs.**

Course Code: EPEG 3010 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	What will be the maximum power transmission per phase if $\|V_s\| = \|V_R\| = 66\ kV$ for three phase transmission and reactance is 11 ohms/phase.	**4**	**CO1**
Q 2	Substantiates that most of alternating current flow on surface of transmission line and by which name this effect is known.	**4**	**CO2**
Q 3	For a given base voltage and base volt amperes, the per unit impedance value of an element is x. What will be the per unit impedance value of this element when the voltage and volt amperes bases are both doubled?	**4**	**CO1**
Q 4	What do you understand by sequence impedance?	**4**	**CO1**
Q 5	Derive the ABCD parameters for medium transmission line Pi model.	**4**	**CO2**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Utilize electromagnetic principles to deduce inductance expressions for an untransposed 3-phase transmission line. Elaborate on the significance of the imaginary term within the inductance expression. Subsequently, formulate an inductance expression for a fully transposed 3-phase transmission line.	**10**	**CO3**
Q 7	Determine the capacitance and charging current per unit length of the line when the arrangement of the conductors is as shown in Figure. 	**10**	**CO4**
Q 8	Explain the concept of the 'method of images' in the context of electrical engineering. Derive an expression for the capacitance per unit length of a fully transposed three-phase transmission line. Additionally, discuss how the presence of the Earth affects the capacitance of the line.	**10**	**CO3**

Q 9	The voltages across a 3-phase unbalanced load are Va = 300 V, Vb = 300 ∠ – 90° V and Vc = 800 ∠ 143.1° V respectively. Determine the sequence components of voltages. Phase sequence is abc. **OR** Show that to simulate a L-G fault all the three sequence networks are required and must be connected in series.	**10**	**CO5**
SECTION-C (2Qx20M=40 Marks)			
Q 10	A generator supplies a motor through a Y/Δ transformer. The generator is connected to the star side of the transformer. A fault occurs between the motor terminals and the transformer. The symmetrical components of the subtransient current in the motor flowing towards the fault are Ia1 = – 0.8 – j2.6 p.u., Ia2 = – j2.0 p.u. and Ia0 = – j3.0 p.u. From the transformer towards the fault Ia1 = 0.8 – j0.4 p.u., Ia2 = – j1.0 p.u. and Ia0 = 0. Assume X″ = X2 for both the motor and the generator. Describe the type of fault. Find (i) the pre-fault current if any, in line 'a' (ii) the subtransient fault current in p.u. and (iii) the subtransient current in each phase of the generator in p.u. **OR** A single circuit 50 Hz, 3-phase transmission line has the following parameters per km: R = 0.25 ohm, L = 1.3 mH and C = 0.02 micro F The voltage at the receiving end is 132 kV. If the line is open at the receiving end, find the rms value and phase angle of the following: (i) The incident voltage to neutral at the receiving end (ii) The reflected voltage to neutral at the receiving end. (iii) Efficiency of the line if the line is 120 km long and delivers 40 MW at 132 kV and 0.8 p.f. lagging	**20**	**CO5**
Q 11	Determine the fault current and the line-to-line voltage at the fault when a line-to-line fault occurs at the terminals of the alternator of 25 MVA, 13.2 kV with solidly grounded neutral and subtransient reactance of 0.20 p.u. The negative and zero sequence reactances are 0.30 and 0.15 p.u. respectively.	**20**	**CO4**