Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:3150911 Date:28-05-2025

Subject Name:Power System- II

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	What is the per-unit system? Give the advantages of the per-unit system.	**03**
	(b)	What is the balanced three-phase power? Prove that under balance conditions, the sum of phasors is zero.	**04**
	(c)	A 3-phase, 11kV, 15 km length, transmission line supplying a load of 850 kW at 0.8 power factor lagging, has resistance (R)= 0.45 Ω/km and reactance (X) = 0.60 Ω/km. Calculate, (i) the line current, (ii) receiving end voltage, (iii) voltage regulation, and (iv) the efficiency of power transmission.	**07**
Q.2	**(a)**	Explain in detail the sub-transient, transient, and steady-state reactance by drawing a proper transient wave.	**03**
	(b)	Obtain the equivalent circuit of the medium transmission line using nominal-π (PI) representation.	**04**
	(c)	Explain the working of a synchronous generator connected to an infinite bus. Draw equivalent circuit and phasor diagram.	**07**
		OR	
	(c)	A 275kV transmission line has the following line constants: $A = 0.85\angle 5°$, $B = 200\angle 75°$ Determine the power at unity power factor that can be received, if the voltage profile at each end will be maintained at 275 kV.	**07**
Q.3	**(a)**	What is fault? Classify various types of fault conditions of power system. Give the significance of the fault impedance.	**03**
	(b)	Explain salient pole synchronous generator with power angle curve in short.	**04**
	(c)	Give the analysis of double line to ground fault considering the effect of fault impedance.	**07**
		OR	
Q.3	**(a)**	Show that symmetrical component transformation is power invariant.	**03**
	(b)	Derive the necessary equations to obtain symmetrical components from the phase quantities.	**04**
	(c)	Explain the zero-sequence impedance of the transformer for various connections.	**07**
Q.4	**(a)**	What is insulation coordination? Define and explain BIL.	**03**
	(b)	Explain in brief the different methods of voltage control employed in power systems.	**04**
	(c)	Explain types of lightning strokes.	**07**

OR

Q.4	**(a)**	Justify, that for a fault at alternator terminals, a single line-to-ground fault is generally more severe than a three-phase fault.	**03**
	(b)	Explain various factors affecting Corona effect of the transmission line.	**04**
	(c)	Find the critical disruptive voltage and corona loss for a 3-phase line that is operating at 220 kV, 50 Hz frequency. The line has a conductor of 1.5 cm diameter arranged in a 3-meter delta connection. Assume air density of 1.05 and dielectric strength of air to be 21.1 kV/cm.	**07**
Q.5	**(a)**	Define surge impedance and explain the surge impedance loading of the transmission line.	**03**
	(b)	Explain any two causes which are producing transients on a transmission line.	**04**
	(c)	Write a note on the following: (1) Lightning Arresters (2) Surge absorber	**07**

OR

Q.5	**(a)**	Write a brief note on capacitance switching.	**03**
	(b)	Define the following terms (i) transient (ii) restriking (iii) recovery voltage.	**04**
	(c)	Explain in brief the traveling waves of the transmission line when the receiving end is short-circuited.	**07**

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