

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZINAGARAM

III B. Tech I Semester Supplementary Examinations November -2025

POWER SYSTEM ANALYSIS

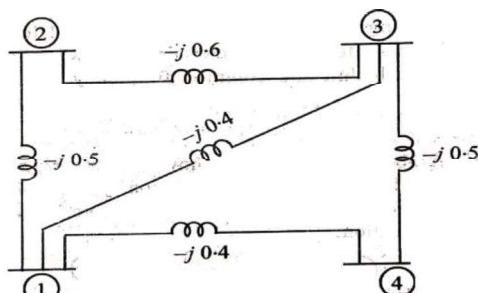
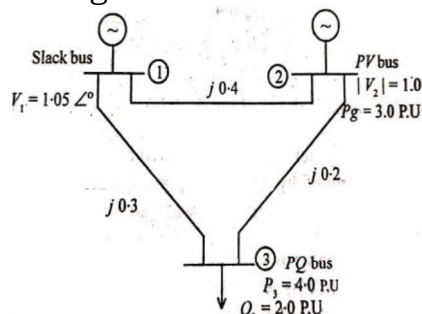
(ELECTRICAL & ELECTRONICS ENGINEERING)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I			
1.	a)	Define per unit representation of electrical quantities? List out its advantages.	[7M]
	b)	Find the bus admittance matrix for network given below in Figure-1.	[7M]
 <p style="text-align: center;">Fig. 1</p>			
(OR)			
2.	a)	Show that the per unit equivalent impedance of a two winding transformer is the same whether the calculation is made from the high voltage side or the low voltage side.	[7M]
	b)	A 120 MVA, 19.5 kV generator has $X = 1.5$ percent and is connected to a transmission line by a star-delta transformer rated 150MVA, 230/18kV with $X = 0.1$ percent. If the base to be used in the calculations is 100MVA, 230kV for the transmission line, find the per unit values to be used for the transformer and generator reactances.	[7M]
UNIT-II			
3.	a)	Define load flow studies and derive its necessary static load flow equations?	[7M]
	b)	A three bus power system is shown in Figure-2. Carryout one iteration of load flow solution by Decoupled method. Neglect limits on reactive power generation.	[7M]
 <p style="text-align: center;">Fig. 2</p>			
(OR)			
4.	a)	Why do we go for iterative methods to solve load flow problems?	[7M]

		What do you mean by a flat voltage start?	
	b)	Explain clearly with a flow chart the computational procedure for load flow solution using Newton-Raphson method when the system contains all types of buses.	[7M]
		UNIT-III	
5.	a)	With the help of a detailed flow chart, explain how a symmetrical fault can be analyzed using Z_{BUS} .	[7M]
	b)	Discuss the harmful effects of short circuit faults in the power system?	[7M]
		(OR)	
6.	a)	What is synchronous reactance? What is the significance of sub-transient reactance and transient reactance in short circuit studies?	[7M]
	b)	A 3 – Phase, 5MVA, 6.6KV alternator with a reactance of 8% is connected to a feeder of series impedance of $0.12+j0.48$ ohms/phase per Km. The transformer is rated at 3 MVA, 6.6KV/33KV and has a reactance of 5%. Determine the fault current supplied by the generator operating under no load with a voltage of 6.9KV, when a 3 – Phase symmetrical fault occurs at a point 15Km along the feeder.	[7M]
		UNIT-IV	
7.	a)	What symmetrical components? Explain the symmetrical component transformation.	[7M]
	b)	An earth fault occurs on one conductor of a 3 conductor cable supplied by a 10MVA, 3 phase alternator has positive negative and zero sequence impedance of $(0.5+j4.7) \Omega$, $(0.2+j0.6) \Omega$ and $j0.43\Omega$ per phase. The corresponding line to neutral values for the cable up to fault position are $(0.36+j0.25) \Omega$, $(0.36+j0.7) \Omega$ and $(2.5+j0.95) \Omega$ per phase. Find fault currents and sequence components of currents. The generator is excited to give 6.6kV between lines on open circuit.	[7M]
		(OR)	
8.	a)	The phase 'b' of a three phase circuit is open. The currents in phases 'c' and 'a' are I and -I respectively. Determine the positive, negative and zero sequence components of the current in phase 'a'.	[7M]
	b)	Find the fault current when an L-L-G fault occurs at the terminals of an unloaded generator. Derive an expression for the positive sequence current I_{a1} of an unloaded generator when it is subjected to a double line to ground fault.	[7M]
		UNIT-V	
9.	a)	Discuss the various factors affecting the transient stability of the system.	[7M]
	b)	What are the essential factors for stability problems? Discuss the various methods of improving steady state stability.	[7M]
		(OR)	
10.	a)	Derive the swing equation for a single machine connected to infinite bus system. State the assumptions if any and state the usefulness of this equation. Neglect the damping.	[7M]
	b)	A 2 pole 50 Hz, 11kV turbo generator has a rating of 60 MW at 0.85 power factor lagging. Its rotor has a moment of inertia of 8800 kg-m ² . Calculate its inertia constant in MJ/MVA and its angular momentum in MJ-s/elect. Degree.	[7M]