

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

III B.Tech II Semester Regular/Supplementary Examinations, April - 2024

**POWER SYSTEM ANALYSIS
(EEE)**

Time: 3 hours

Max. Marks: 70M

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions				BTL	CO	Marks		
UNIT – I									
1.	a)	Derive the expression for bus admittance matrix Y_{Bus} in terms of primitive admittance matrix and bus incidence matrix.				K2	CO1	7M	
	b)	A 150MVA, 12.6 kV, three phase generator has a sub transient reactance of 10%. The generator supplies two synchronous motors through a 50 km transmission line having transformers at both ends. In this, first transformer is a three phase, 100MVA, 12.6/220 kV, 10% reactance and second one is made of three single phase transformers of rating 33.33MVA, 127/10.5 kV, 10% reactance. Synchronous motors ratings are 100MVA and 50 MVA and both operating at 10.5kV with 20% sub transient reactance. Series reactance of transmission line is 0.3 ohm/ km. Draw the single line diagram with all marked in p.u.				K3	CO1	7M	
OR									
2.	a)	What are the advantages of Y_{Bus} over Z_{Bus} ?				K1	CO1	7M	
	b)	Find the Y_{Bus} matrix by singular transformation method for the following data given in the table.				K3	CO1	7M	
		Element	Bus code	Self impedance	Bus code				Mutual impedance
		1	1-2	j0.25 p.u					
		2	2-3	j0.5 p.u	1-2				j0.1 p.u
3	1-3	j0.25 p.u							
UNIT – II									
3.	a)	What is the need for load flow study and Explain the classification of Buses.				K2	CO2	7M	
	b)	Derive the static load flow equations of a power system and mention the assumptions made.				K2	CO2	7M	
OR									
4.	Explain clearly with detailed flowchart the computational procedure for load flow solution using fast decoupled load flow method when the system contains all types of buses.					K2	CO2	14M	
UNIT – III									
5.	a)	Derive the expression for short circuited MVA.				K2	CO3	4M	
	b)	Develop the Z_{Bus} using building algorithm for a power system whose element data is given in the following table and determine the Z_{bus} if element 5 is removed.				K3	CO3	10M	

			Element	Bus code	Self impedance				
			1	1-2	j0.2 p.u				
			2	2-3	j0.25 p.u				
			3	3-4	j0.1 p.u				
			4	1-4	j0.25 p.u				
			5	2-4	j0.3 p.u				
OR									
6.	a)	Explain how a synchronous generator is represented in short circuit analysis.					K2	CO3	7M
	b)	Find short circuit MVA at the bus bars of a generating station 500 MVA and other station is 200 MVA. The generated voltage of each station is 12 kV. Also find the possible short circuit MVA at each station when they are linked by an inter connected cable with a reactance of 0.6Ω .					K3	CO3	7M
UNIT – IV									
7.	a)	Draw and explain the positive, negative, zero sequence impedance diagrams for different 3-phase transformer winding connections.					K2	CO4	7M
	b)	Determine the symmetrical components of the following set of unbalanced currents $I_a = 6.1 \angle 250^\circ$, $I_b = 0.1 \angle 180^\circ$ and $I_c = 9.0 \angle 132^\circ$. Also find out the neutral current.					K3	CO4	7M
OR									
8.	a)	What are the various types of faults? 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 through impedance.					K3	CO4	7M
	b)	Determine unbalanced vectors from their symmetrical components.					K3	CO4	7M
UNIT – V									
9.	a)	Explain the methods to improve steady state stability.					K2	CO5	5M
	b)	A loss-free generator supplies 60MW to an infinite bus, the steady state limit of the system being 120MW. Determine whether the generator will remain in synchronism if the prime mover input is abruptly increased by 40MW.					K3	CO5	9M
OR									
10.	a)	Explain how the equal area criterion applied when there is a sudden increase in power input.					K2	CO5	7M
	b)	Derive the swing equation and explain with neat diagram.					K2	CO5	7M