U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

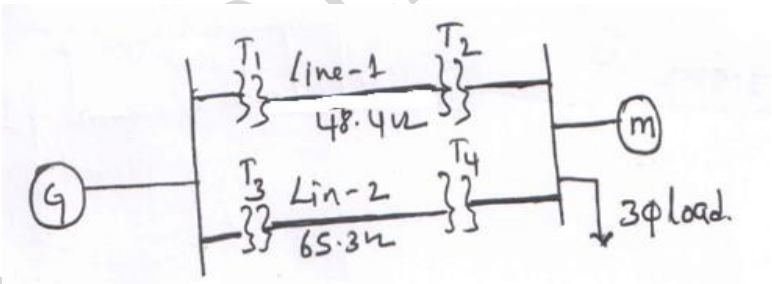
July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PCPSA **Max Marks: 100**
Course: Power System Analysis

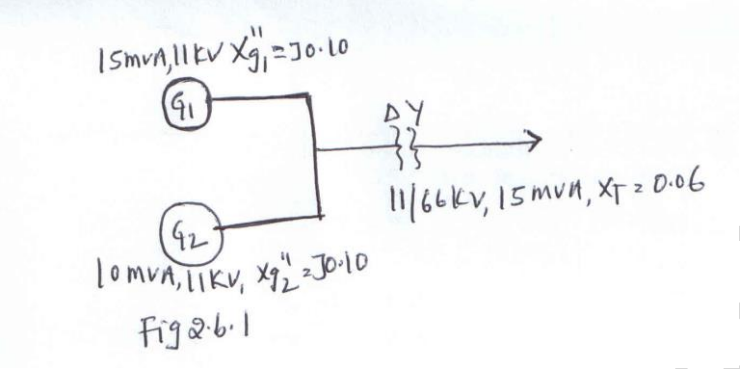
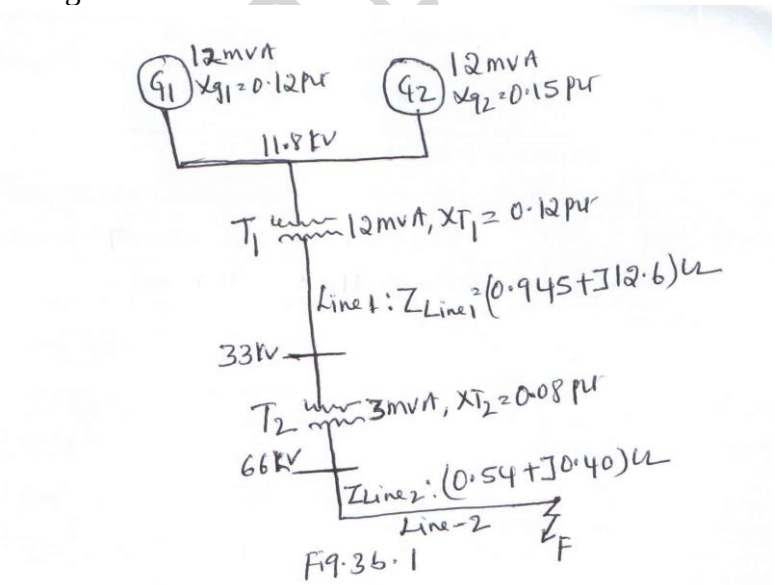
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

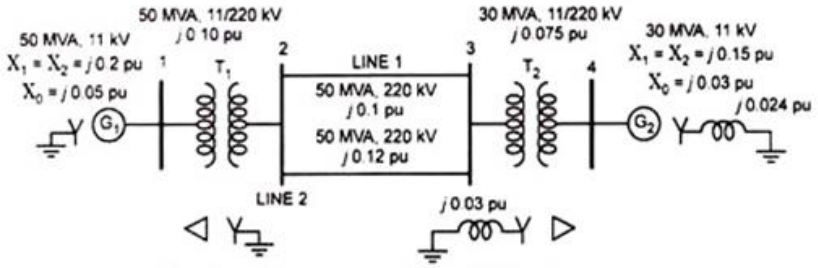
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Derive an expression for the following: a. How will you change the base impedance from one set of base values to another set? (03M) b. Per unit value of a quantity on either side of transformer is same. (03M) c. List the advantages of the per unit value of a quantity. (04M)	*CO1*	*PO1*	**10**
	b)	Draw the per unit reactance diagram for the system shown in figure below. Choose a base of 22 kV, 100 MVA in the generator circuit.	*CO1*	*PO2*	**10**



Data			
Items	MVA	KV	X
Generator	90 MVA	22 kV	18%
Transformer-1(T1)	50 MVA	22/220 kV	10%
Transformer-2(T2)	40 MVA	220/11 kV	6.0%
Transformer-3(T3)	40 MVA	22/110 kV	6.4%
Transformer-4(T4)	40 MVA	110/11 kV	8.0%
Transmission line-1: 48.4 Ω ; Transmission line-2: 65.3Ω			
Motor	66.5MVA	10.45 kV	18.5%
Three phase load 57 MVA, 0.6pf lagging 10.45 kV			
Choose a base of 22 kV, 100 MVA in the Generator circuit.			

			UNIT - II			
	2	a)	Analyses and develop the doubling effect of the short circuit during symmetrical fault on a transmission line including wave forms.	*CO2*	*PO2*	**10**
		b)	Two generators G_1 and G_2 are rated 15 MVA, 11 kV and 10 MVA, 11 kV respectively. The generators are connected to a transformer as shown in fig. Calculate the sub transient current in each generator when a three phase fault occurs on the high voltage side of the transformer.  Fig 2.6.1	*CO2*	*PO2*	**10**
			OR			
	3	a)	Analyses and develop expression for the maximum momentary current twice the maximum value of symmetrical short circuit current of the short circuit during symmetrical fault on a transmission line including waveforms.	*CO2*	*PO2*	**10**
		b)	A radial power system network is shown in fig. a three phase balanced fault occurs at F. Determine the fault current and the line voltage at 11.8 kV bus under fault condition.  Fig. 3.5.1	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	Analyses and develop the relation between: a) Phase voltages in terms of symmetrical components (05M).	*CO2*	*PO2*	**10**

			b) Prove that a balanced set of three phase voltages will have only positive sequence components of voltages only. (05M).			
		b)	For the power system shown in Fig. with the data given, draw the zero sequence, positive sequence and negative sequence networks. Assume base 50 MVA &11 kV on generator side.  	*CO2*	*PO2*	**10**
			UNIT - IV			
5	a)		Analyze and develop an expression for fault current, line current for line to line fault on unloaded generator through impedance. Draw the inter connection of sequence network.	*CO2*	*PO2*	**10**
	b)		A 30 MVA, 13.2 kV synchronous generator has a solidly grounded neutral. Its positive, negative and zero sequence impedances are 0.30, 0.40 and 0.05 p.u respectively. Evaluate the following: a) What value of reactance must be placed in the generator neutral so that the fault current for a line to ground fault of zero fault impedance shall not exceed the rated line current? b) What value of resistance in the neutral will serve the same purpose? c) What value of reactance must be placed in the neutral of the generator to restrict the fault current to ground to rated line current for a double line to ground fault?	*CO2*	*PO2*	**10**
			UNIT - V			
6	a)		Analyze and develop the relation for power-angle equation of a salient pole synchronous machine connected to an infinite bus and also draw the power angle curve.	*CO3*	*PO2*	**10**
	b)		Evaluate the SSSL of a system consisting of a generator of equivalent reactance 0.5 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.2 pu and voltage of the infinite bus is 1.0 pu.	*CO3*	*PO2*	**10**
			OR			
7	a)		Analyze and develop an expression for application of equal area criterion with the case of sudden change in input.	*CO3*	*PO2*	**10**
	b)		Define the following: a) Stability. b) Transient stability. c) Steady state stability limit. d) Swing curve. e) Power angle.	*CO3*	*PO1*	**10**

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