Reg.No.:											

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
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Question Paper Code: 8017

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – MAY / JUNE 2024
Fifth Semester
Electrical and Electronics Engineering
U19EE518 – POWER SYSTEM ANALYSIS
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer all the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

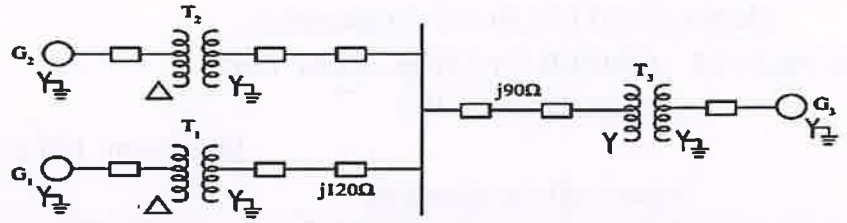
(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	If the reactance in ohms is 15 Ohms. Find the p.u value for a base of 15 KVA and 10 KV.	2	K2	CO1
2.	Give equation for transformation of base KV on LV side to HV side of transformer and vice-versa.	2	K2	CO1
3.	What is the need for load flow analysis?	2	K1	CO2
4.	Compare GS and NR method.	2	K1	CO2
5.	Define bolted fault.	2	K1	CO3
6.	What is the need for short circuit studies?	2	K2	CO3
7.	What are the causes of unsymmetrical faults?	2	K2	CO4
8.	Define negative sequence and zero sequence components.	2	K1	CO4
9.	How to improve the transient stability limit of the power system.	2	K1	CO5
10.	Define critical clearing angle.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Fig shows a single line diagram of unloaded three generator power system with inter connection between the generator by means of 3 transformers & a transmission line. The rating of three transformer are given below.	13	K3	CO1



Generator	MVA	KV	Reactance in Permit
1.	25	6.6	0.2
2.	15	6.6	0.15
3.	30	13.2	0.15

Transformer 1 : 30 MVA, 6.9 Δ- 115 Y KV , X=10%
Transformer 2 : 15 MVA, 6.9 Δ- 115 Y KV , X=10%
Transformer 3 : single phase units, each Rated 10 MVA, 6.9/69 KV, X =10%.
Draw an impedance diagram & mark all values P.U choosing a base of 30 MVA, 6.6 KV in generator 1 circuit.

(OR)

b)	Interpret the operation of power system by Schematic diagram. Explain need for analysis in planning & operation of power system.	13	K3	CO1
12. a)	The parameter of a 4 bus system are as under	13	K3	CO2

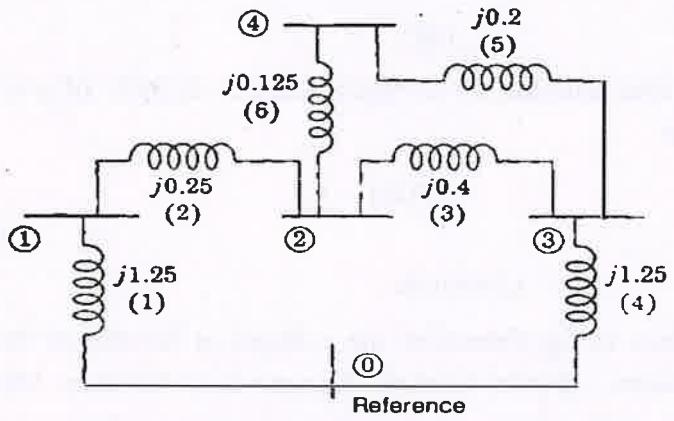
Starting Line Bus	Ending Line bus	Impedance	Line charging admittance
1	2	0.25+j0.8	j0.02
2	3	0.35+j0.9	j0.03
2	4	0.25+j1.0	j0.04
3	4	0.25+j0.8	j0.02
1	3	0.15+j0.4	j0.01

Draw the network and find admittance matrix.

(OR)

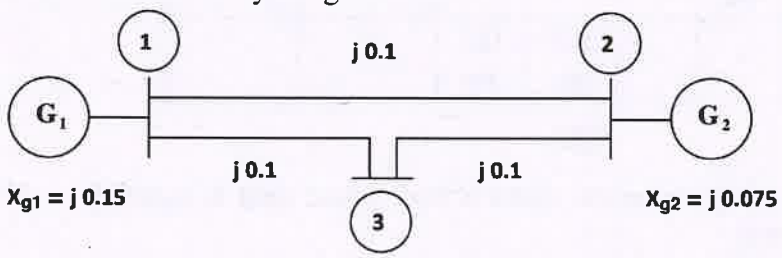
b)	Derive N-R method of load flow algorithm and explain the implementation of this algorithm with the flowchart.	13	K3	CO2

13. a) Examine the bus impedance matrix using bus building algorithm for given network. 13 K3 CO3



(OR)

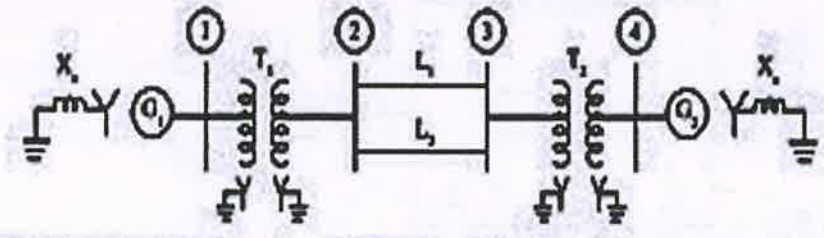
b) Consider the power system shown in fig. The values marked are P.U. Impedance. The P.U reactance of the generator 1 & 2 are 0.15 and 0.075 respectively. The impedance are on a base of 50 MVA and 12 KV. Symmetrical short circuit occurs at bus 3 with zero fault impedance Using Z_{bus} matrix determine the fault current, bus voltage and also current contributed by the generator. 13 K3 CO3



14. a) Derive the expression for fault current in line to line fault on unloaded generator and draw an equivalent network showing the interconnection of networks. 13 K3 CO4

(OR)

b) Determine the fault current and MVA at bus 4 as shown in fig for LG fault 13 K3 CO4



G1, G2 : 100 MVA, 11 KV, $X^+ = X^- = 15\%$, $X_o = 5\%$, $X_a = 6\%$

T1, T2 : 100 MVA, 11 KV/220 KV, $X_{leak} = 9\%$

L1, L2 : $X^+ = X^- = 10\%$, $X_o = 10\%$, on a base of 10 MVA

Consider a fault at phase 'a'.

15. a) Examine the swing equation of a synchronous machine swinging against an infinite bus. Clearly state the assumption in deducing the swing equation. 13 K2 CO5

(OR)

b) Analyse equal area criterion for transient stability analysis of a system with application. 13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO

16. a) For the system shown in fig, determine the voltages at the end of the first iteration by Gauss – Seidal Method. Assume base MVA as 100 15 K3 CO2

Bus No	Voltage	Generator		Load		Q_{min} MVAR	Q_{max} MVAR
		P	Q	P	Q		
1	$1.06\angle 0^0$ pu	-	-	-	-	-	-
2	1.02 pu	0.3 pu	-	-	-	-10	100
3	-	-	-	0.4 pu	0.2 pu	-	-

(OR)

b) Given the system of figure below where a three phase fault is Applied at a point P as shown. 15 K3 CO5

Examine the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance vales of various components are indicated on the diagram. The generator is delivering 1.0 p.u power at the instant preceding the fault. The fault occurs at point P as shown in above figure.