Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80010

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 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.	Summarise the need for power system network analysis.	2	K2	CO1
2.	Determine the per unit (p.u) value of a power system with a base of 15KVA and 10KV and reactance 15 ohms.	2	K2	CO1
3.	Define Slack bus and recall its need in power flow studies.	2	K1	CO2
4.	Recall the general expression for power flow equation.	2	K1	CO2
5.	List the different types of electrical faults in power system.	2	K1	CO3
6.	Why the three-phase short circuit current is considered as the base during design of circuit breakers?	2	K1	CO3
7.	Identify, why the neutral grounding impedance Zn appears as 3Zn in the zero sequence networks.	2	K2	CO4
8.	List the boundary conditions for LL fault.	2	K2	CO4
9.	Compare steady state and transient stabilities.	2	K2	CO5
10.	Classify the latest trends to improve power system stability.	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Outline a single line diagram of a power system network showing generation, transmission, distribution and utilisation and explain its basic components.	13	K1	CO1
		(OR)			
	b) i.	Illustrate the Indian power scenario and growth from 2010 to till date and discuss the anticipated demand by 2030 and ways to meet it.	7	K2	CO1
	ii.	Explain the modelling of generator for short circuit power flow and stability analysis.	6	K3	CO1
12.	a)	Construct the admittance matrix Y bus of the network shown in Fig:1 as per the data given in Table:1. Take node 1 as reference.	13	K3	CO2

Fig:1

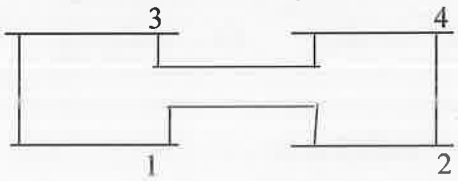


Table:1

	Self		Mutual	
S.No	Bus Code	Impedance	Bus Code	Impedance
1	1 - 2	0.5	1 -2	0.1
2	1 - 3	0.6		
3	3 - 4	0.4		
4	2 - 4	0.3		

(OR)

b) The system data for a load flow solution are given in Table:2 and Table:3. Determine the voltages at the end of the first iteration using Gauss Seidal method. Assume α =1.6. 13 K3 CO2

Table:2

BUS	ADMITTANCE
1 - 2	2 – j8
1 - 3	1 – j4
2 - 3	0.67 – j2.66
2 - 4	1 – j4
2 - 4	2 – j8

Table:3

BUS	P in p.u	Q in p.u	V in p.u	Remarks
1	---	---	1.06	Slack
2	0.5	0.2	1 + j 0	PQ
3	0.4	0.3	1 + j 0	PQ
4	0.3	0.1	1 + j 0	PQ

13. a) A 3-phase 33 KV transmission line has resistance = 5 ohms and reactance = 15 ohms is connected to a generating station us bar through a 5 MVA step up transformer having a reactance of 0.05 p.u. Two Alternators are connected to bus bar are 10 MVA with 0.08 p.u. reactance and another of 5 MVA 0.06 p.u. reactance. Calculate the KVA at a short circuit fault between phases occurring at high voltage terminals of the transformers. 13 K2 CO3

(OR)

b) Construct the transient and synchronous reactance expressions of a synchronous machine on no load at short circuit conditions. 13 K3 CO3

14. a) Illustrate positive, negative and zero sequence impedances and network. Also obtain the same for a 3-phase balanced transmission line. 13 K2 CO4

(OR)

b) Identify the reasons for cause of Line- Ground (L-G) fault in a power system network. Hence derive the fault current when L-G fault occurs at the terminals of an alternator with load impedance Zf. 13 K3 CO4

15. a) Explain rotor dynamics and derive the swing equation for a synchronous machine. 13 K2 CO5

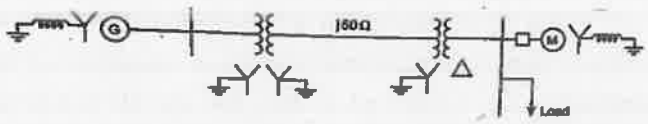
(OR)

b) Explain the computational algorithm to solve swing equations using modified Euler method. 13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Develop the step by step procedure to be followed to find the per unit impedance diagram of a power system.	5	K3	CO1
		ii.	Estimate the per unit reactance diagram for the power system shown below. Assume base values as 100 MVA, 220KV in 50 ohms transmission line neglecting resistance. The ratings of Generator, transformers and motors are Generator : 40 MVA, 25KV Transformer: Y-Y – 33KV / 220V 40 MVA Transformer: Δ-Y – 33KV / 220V 40 MVA Motor : 50 MVA, 11KV Load : 50 MW + j 68MVAr	10	K3	CO1



b)	Illustrate the iterative solution using Newton's Raphson load flow algorithm with a flow chart representation for the computational analysis of load flow studies of a power system network.	15	K2	CO2