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

Question Paper Code: 80006

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025

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

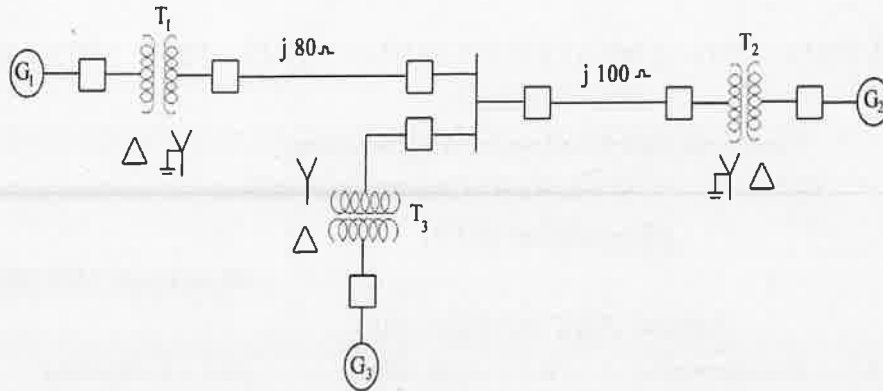
(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Write the assumptions made in the per unit representation.	2	K1	CO1
2.	The reactance of a generator is given as 0.25 per-unit based on the generator of 18 kV, 500 MVA. Find its per-unit reactance on a base of 20 kV, 100 MVA.	2	K2	CO1
3.	What is Slack Bus?	2	K1	CO2
4.	Infer the advantages and disadvantages of Gauss-Seidel Method.	2	K2	CO2
5.	Interpret the given statement: “The Z bus method is very suitable for fault studies on large system”.	2	K2	CO3
6.	Define bus impedance.	2	K1	CO3
7.	Infer the terms: Positive sequence components and zero sequence components.	2	K2	CO4
8.	Illustrate the sequence network diagram for a line to line fault including the effect of fault impedance.	2	K2	CO4
9.	Define transient state stability limit.	2	K1	CO5
10.	Interpret the assumptions made in multi machine stability studies.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

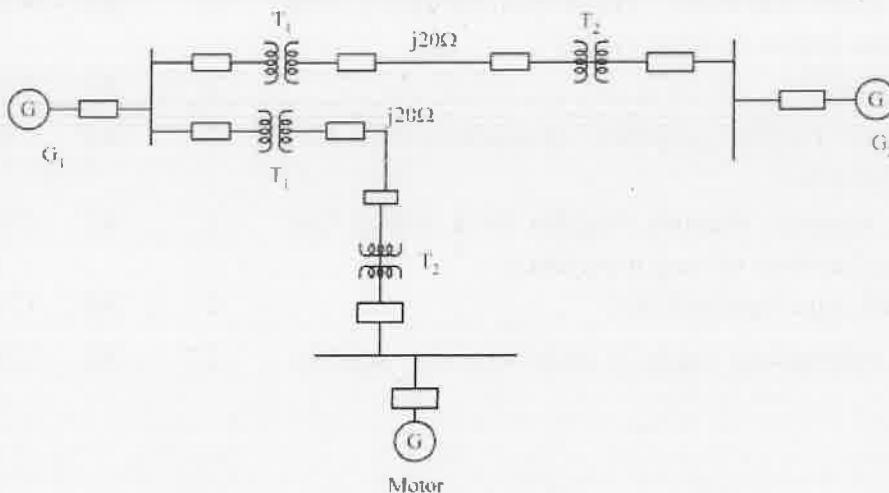
Q.No.	Questions	Marks	KL	CO
11. a)	The single line diagram of an unloaded power system is shown in figure. The generator and transformer ratings are as follows	13	K2	CO1



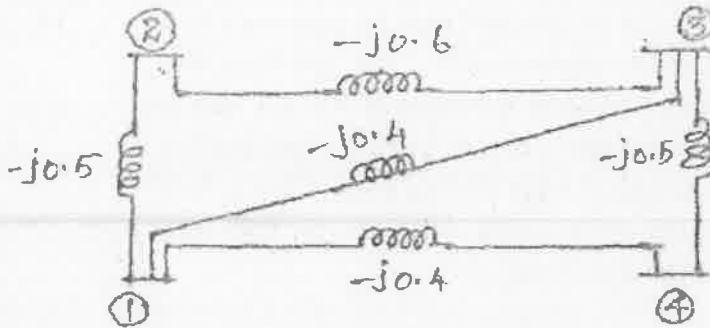
G1:20 MVA, 13.8KV, $X'' = 20\%$. G2:30 MVA, 18KV, $X'' = 20\%$
 G3:30 MVA, 20KV, $X'' = 20\%$, T1:25 MVA, 220/13.8KV, $X = 10\%$
 T2:3 single phase units each rated 10 MVA, 127/18KV, $X = 10\%$
 Illustrate the reactance diagram using a base of 50MVA and 13.8 KV on the generator 1.

(OR)

b)	Illustrate the impedance diagram for the power system as shown below. Use a Base of 45KVA, 20KV at generator G1. The ratings of the generators and transformers are:	13	K2	CO1
	Generator1: 20MVA, 18KV, $X = 20\%$,			
	Generator2: 20MVA, 20KV, $X = 20\%$,			
	Synchronous motor 3, 35 MVA, 20KV, $X = 20\%$,			
	Transformer 1: Three phase Y-Y: 20 MVA, 148 Y/20 Y KV, $X = 10\%$,			
	Transformer 2: Three phase Y- Δ : 10MVA, 148 Y / 20 Δ KV, $X = 10\%$,			



12. a) Find the bus admittance matrix for the network given below . Determine the reduced admittance matrix by eliminating node 4. The values are marked in p.u

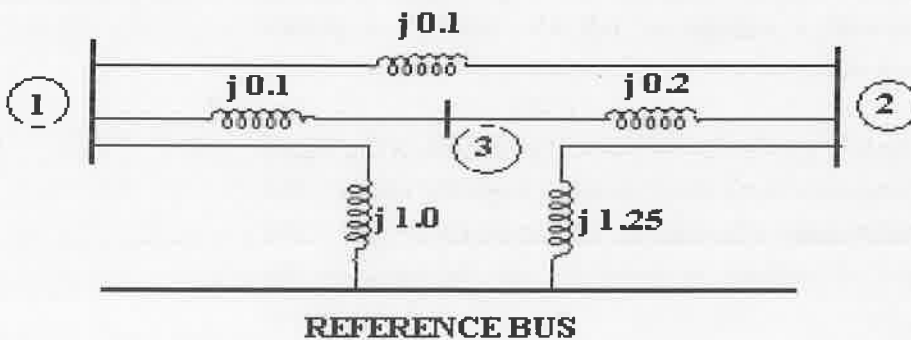


(OR)

- b) Develop a load flow algorithm using Newton Raphson Method with flow chart and discuss the advantages of the method.
13. a) Explain the step by step procedure for constructing the bus impedance matrix using the building algorithm and apply the algorithm to a small system.

(OR)

- b) Find the Z bus for a 3 bus system as shown in the following figure.



14. a) A salient pole generator without damper is rated 30MVA, 13.8 KV and has a direct axis sub transient reactance of 0.2 p.u. The negative and zero sequence reactances are 0.3 and 0.15 p.u respectively. The neutral of the generator is solidly grounded. Determine the sub-transient current in the generator and the line to line voltages during sub transient conditions when a line to ground fault occurs at the generator terminals with generator operating unloaded at rated voltage.

(OR)

- b) Derive the expression for fault current for a line to line fault occurring through an impedance Z_b in a power system. 13 K2 CO4
15. a) Derive the swing equation step by step and explain its use in power system stability analysis. 13 K2 CO5

(OR)

- b) A 50 Hz, 500 MVA, 400 KV generator (with transformer) is connected to a 400 KV infinite bus bar through an interconnector. The generator has $H = 2.5$ MJ / MVA, Voltage behind transient reactance of 450 KV and is supplying 460 MW. The transfer reactances between generator and bus bar under various conditions are : Prefault 0.5 p.u During Fault 1.0 p.u Post fault 0.75 p.u. Calculate the swing curve using intervals of 0.05 sec and assuming that the fault is cleared at 0.15 sec. 13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|--|-------|----|----|
| 16. a) | A 3 phase, 5 MVA, 6.6 kV alternator with a reactance of 8% is connected to a feeder series impedance $(0.12+j0.48)$ ohm/phase/km through a step up transformer. The transformer rated at 3 MVA, 6.6 kV/33kV and has reactance of 5%. Determine the fault current supplied by the generator operating under no load with a voltage of 6.9 kV, when a 3 phases symmetrical fault occurs at a point 15 km along the feeder. 15 K3 CO3 | | | |
| (OR) | | | | |
| b) | A three phase fault is applied at the point P as shown in the figure given below. Determine the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. the reactance values of various components are indicated in the diagram. The generator is delivering 1.0 p.u. power at the instant preceding the fault. 15 K2 CO5 | | | |

