Roll No. | | | | | | | | | | | | |

Total No. of Pages : 03

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B.Tech. (EE/EEE) (Sem.–7,8)

COMPUTER AIDED POWER SYSTEM ANALYSIS

Subject Code : EE-402

M.Code : 57055

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define per unit value of any electrical quantity.

b) What are the different steps to be followed for drawing a impedance diagram from a given single line diagram of power system?

c) Draw power angle curve of a synchronous generator.

d) What is difference between constant power and constant impedance representation of loads in power systems?

e) Why PQ bus is also known as load bus in load-flow studies?

f) Why acceleration factor is used in Gauss-Siedel methods of load-flow?

g) Why open conductor faults are known as series faults?

h) Determine the symmetrical components of three voltages $V_a = 200\angle L0°$, $V_b = 200\angle 245°$, and $V_c = 200\angle 105°$

i) Define steady state operating condition.

j) With reference to power system stability, discuss swing equation.

SECTION-B

2. Single line representation of a simple power system is shown in figure 1. Obtain the per unit impedance diagram of power system shown in Figure 1. Specifications are given in

Table 1. Transmission line is having reactance of 20.5 Ω/phase.

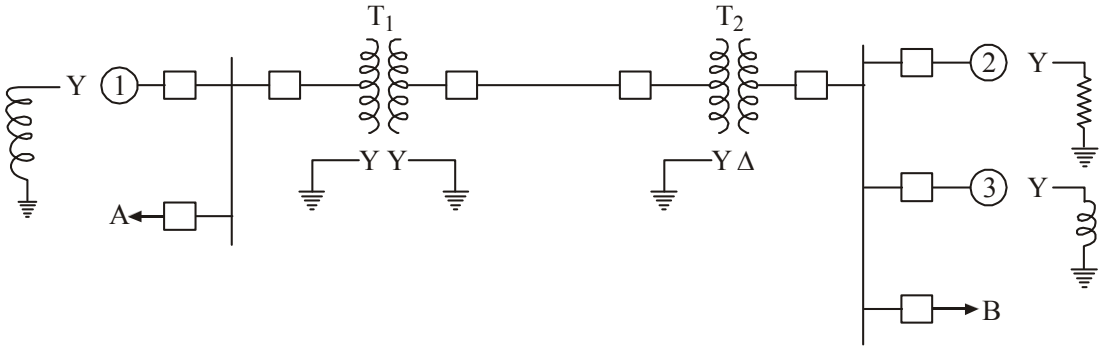

FIG.1

Figure 1: Single line representation of power system

Table 1: Specifications of power system given in Figure 1

Generator No.	**MVA rating**	**Line to line voltage (kV)**	**Per phase reactance in Ω**
1	30	10.5	1.6
2	15	6.6	1.2
3	25	6.6	0.56
Transformer No.	MVA rating	Line to line voltage transformation in kV	Per phase impedance in Ω
1	15	33/11	15.2 (HT side)
2	15	33/6.2	16 (HT side)
Type of LOAD	MW	Line to line voltage in kV	Power factor
A	40	11	0.9 lagging
B	40	6.6	0.85 lagging

3. Write a note on system modelling of transformers.

4. Line data of a four bus system is given in Table 2.

Table 2 : Line Data of Four Bus System

Line, bus to bus	R in pu	X in pu
1-2	0.05	0.15
1-3	0.10	0.30
2-3	0.15	0.45
2-4	0.10	0.30
2-5	0.05	0.15

Generators are connected at all the buses, while loads are connected at only buses 2 and 3

Assume a flat voltage profile and find the voltages and bus angles at the three buses at the end of first Gauss-Seidel iteration. Input data is given in Table 3.

Table 3: Input data Of Four Bus System

Bus	Active power (pu)	Reactive power (pu)	Voltage (pu)	Type of bus
1	-	-	$1.04\angle 0°$	Slack
2	0.5	-0.2	-	PQ
3	-1.0	0.5	-	PQ
4	0.3	-0.1	-	PQ

5. With the help of mathematical equations, write detailed algorithm to solve load-flow of power system using Newton-Raphson method.

6. Write a note on the formation of impedance matrices for the power systems.

SECTION-C

7. a) Why there is phase shift in star-delta transformers? Support your answer with phasor diagrams.

   b) Draw equivalent circuit diagram of power system showing line to line fault through fault impedance. With the help of boundary conditions, derive mathematical equations using symmetrical components and draw connection of positive, negative and zero sequence networks.

8. Write a note on :

   a) Transients on transmission line

   b) Factors affecting transient stability.

9. Write a note on equal area criterion for two machine system.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.