Register Number: ……..

B.E DEGREE EXAMINATIONS:APRIL/MAY 2014

(Regulation 2009)

Seventh Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

EEE118**:** Power System Analysis and Stability

Time: Three Hours **Maximum Marks: 100**

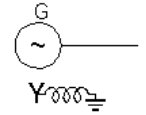
Answer all the Questions:-

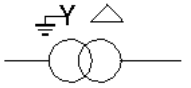
PART A (10 x 1 = 10 Marks)

1. The p.u of any quantity is defined as
   a) $\frac{\text{Actual value}}{\text{Base value}}$ x 100 b) $\frac{\text{Actual value in V}}{\text{Base value in I}}$ x 100
   c) $\frac{\text{Actual value}}{\text{Base value}}$ x 100 d) $\frac{\text{Base KV}^2}{\text{Base MVA}}$ x 100
2. Basically, the generator is modeled as ..... for short circuit analysis
   a) Voltage source in series with reactance b) current source in as series with reactance
   c) Voltage source in parallel with reactance d) Current source in parallel with reactance
3. Power flow analysis gives the knowledge about ..... and.....
   a) V and δ b) R and X
   c) P and Q d) Z and Q
4. The typical value of acceleration factor in the Gauss- Seidel method is
   a) 0.3 to 0.5 b) 0.7 to 0.9
   c) 1.0 to 1.2 d) 1.4 to 1.6
5. Which of the below mentioned is the most severe fault?
   a) Three phase fault b) Single line to ground fault
   c) Open conductor fault d) Double line fault
6. The 3 phase generator has the pre-fault voltage of 1 pu and its sub-transient reactance is 20%. Calculate the fault current contributed by the generator
   a) –j15pu b) -j5 pu
   c) +j8pu d) +j 10 pu.
7. Front time and tail time of surges are generally expressed in .....
   a) Milli-seconds b) Micro seconds
   c) 10 minutes d) 1 hour.
8. The unique characteristic of the short circuit is that, the voltage across it is .....
   a) Equal to the terminal voltage b) Twice the terminal voltage
   c) Could not be measured d) 3. Zero
9. According to equal area criterion, the system is said to be stable.
   a) Accelerating Area = Decelerating area. b) Accelerating area > Decelerating area
   c) Accelerating Area < Decelerating area. d) Accelerating area > 2. Decelerating area
10. Two machines with H_1 and H_2 are connected to the grid. Their equivalent H is,
    a) $Heq = H_1 + H_2$ b) $Heq = H_1 - H_2$
    c) $Heq = \frac{H_1 H_2}{H_1 + H_2}$ d) $Heq = (H_1 - H_2) + H_1$

PART B (10 x 2 = 20 Marks)

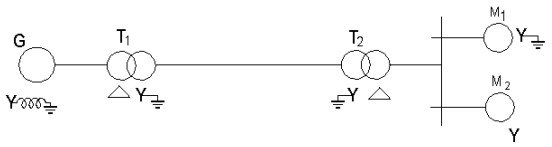
11. List any two advantages of p.u representation.
12. The 3 phase generator with 10 MVA, 11kV capacity has its sub-transient reactance of 15% on its own rating. Convert this on the base of 50MVA, 33kV.
13. Write the power flow equation and describe each variable.
14. What is the significance of slack bus in power flow analysis?
15. Define symmetrical components.
16. Draw the zero sequence circuit of the following.

    i) 

    ii) 
17. Differentiate travelling wave and standing wave.
18. What is the use of Bewley lattice diagram
19. Define stability.
20. Mention some of the techniques used to improve the system stability.

PART C (5 x 14 = 70 Marks)

21. a) Obtain the p.u reactance diagram for the network shown in figure in which the three phase generator is rated 300MVA, 20kV X_d''= 20%. The transmission line is 64 km long with the series reactance of 0.5Ω/km. The 3 phase transformer T_1 is rated 350MVA, 230/20kV, X=10%. Transformer T_2 is composed of 3 numbers of 1-phase transformers each rated 100MVA, 127/132kV X=10% . Two 13.2kV motors with $X_d'' = 0.2$ and 0.1pu. M_1 has rated input of 200MVA and M_2 has rated input of 100MVA. Choose the generator rating as base in the generator circuit.



(OR)

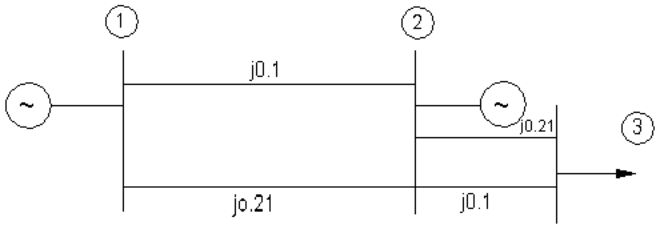
b) (i) Prove that the p u reactance of the transformer, when it is represented will be the same for primary and secondary winding. (7)

(ii) Discuss how the various power system components are modeled for a) short circuit studies b) load flow studies. (7)

22. a) Derive the power flow equation. With the flow chart, explain how Newton-Raphson method can be applied to obtain the solution to power flow equation.

(OR)

b) Consider the network shown in figure.

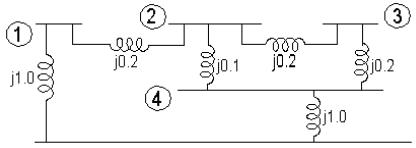


Line impedances are in p.u. The bus data is as below.

Bus	P_G	Q_G	P_L	Q_L	$\lvert V_{sp}\rvert$
1	-	-	-	-	1.0
2	5.32	-	-	-	1.1
3	-	-	3.63	0.54	-

Compute the bus voltage at all the buses at the end of 1st iteration using G.S method.

23. a) Obtain Zbus by building algorithm for the network shown in figure.



(OR)

b) The generator is running on load. A 3 phase double line to ground occurs at the terminals of the generator. Find the expression for fault current and also draw the arrangement of sequence networks for this fault

24. a) Assuming suitable initial conditions, obtain the wave equation.

(OR)

b) (i) What is forked line? How it is represented for transient analysis? (7)

(ii) A step wave of 100kV travels on a line having a surge impedance of 400Ω. The line is terminated by an inductance of 4000μH. Find the voltage across the inductance and the reflected voltage wave. (7)

25. a) Write down the procedure to obtain the solution of swing equation using modified Euler's algorithm.

(OR)

b) A generator is transferring power to a load through a short line. The power angle equation is P=Pm Sinδ. The initial power is P_i pu when a 3- phase fault occurs at the terminals of the generator. Use equal area criterion to find critical cleaning angle and cleaning time if P_m= 2pu P_i = 1pu. H=6MJ / MVA f=50Hz.

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