Register Number: ……

B.E. DEGREE EXAMINATIONS: NOV/DEC 2010

Seventh Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U07EE701: Power System Analysis

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

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. The pu impedance value of an alternator corresponding to base values 13.2KV and 30MVA is 0.2 pu. The p.u. value for the base values 13.8KV and 50 MVA will be

   a) 0.306 pu b) 0.33 pu c)0.318 pu d) 0.328 pu

2. The voltages at the two ends of a line are 132KV and its reactance is 40 ohms. The capacity of the line is

   a) 435.6 MW b) 217.8 MW c)251.5 MW d) 500MW

3. For a load flow solution, the quantities normally specified at a voltage controllled bus are

   a) P,Q b) P,V c)Q,V d) P,□

4. A voltage controlled bus is treated as a load bus in subsequent iterations when its

   a) Voltage limit is violated b) Active power limit is violated

   c) reactive power limit is violated d) phase angle limit is violated

5. The positive, negative and zero sequence impedance of a solidly grounded system under steady state condition always follow the relation

   a) $Z_1 > Z_2 > Z_0$ b) $Z_1 < Z_2 < Z_0$ c) $Z_0 > Z_1 > Z_2$ d)$Z_1 = Z_2 = Z_0$

6. For a fault on transmission line which fault is more severe than single line to ground fault

   a) Earth fault b) double line c) double line to ground d) 3 phase

7. The positive sequence component of voltage at the point of fault is zero when it is a

   a) single line to ground b) double line c) 3 phase d) double line to ground

8. If X is the system reactance and R is the system resistance, the power transferred ia maximum when

   a) X=√2 R b) X=R c) X=2 R d) X=√3 R

9. The inertia constant H of a machine of 200 MVA is 2 pu. Its value corresponding to 400MVA will be

   a) 1 b) 1.5 c)2 d)4

10. For stability and economic reasons we operate the transmission line with power angle in the range

    a) 10 to 25 degrees b) 30 to 45 degrees c) 60 to 75 degrees d) 65 to 80 degrees

PART B (10 x 2 = 20 Marks)

11. Choosing a base MVA of 50 and base KV of 33, Find the value of 10 ohms resistance.
12. Draw the transmission line model used in single line diagram.
13. What is the need of slack bus?
14. What is primitive admittance?
15. Define SCR.
16. Determine the bus impedance matrix for the following power system in figure 1.

17. Classify the faults.
18. What are sequence impedances?
19. Draw the swing curve.
20. State any two disturbances that affect the stabilty of power systems.

PART C (5 x 14 = 70 Marks)

21. a) A 100 MVA 33KV 3 phase generator has a subtransient reactance of 15%. The generator is connected to the motors through a transmission line and transformers as shown in figure 2. The motors have rated inputs of 30 MVA, 20MVA and 50MVA at 30 KV with 20% subtransient reactance. The 3 phase transformers are rated at 110 MVA, 32 KV delta/110KV star with leakage reactance of 8%. The line has a reactance of 50 ohms. Selecting the generator rating as the base quantities in the generator circuit determine the base quantities in other parts of the system and evaluate the corresponding pu values.

(OR)

b) Obtain the pu reactance diagram of the power system shown in figure 3. choose a common 3phase MVA base of 30 and a voltage base of 33 KV line to line on the

transmission line. Then the voltage base in the circuit of generator 1 is 11 KV line to line and that in the circuits of generators 2 and 3 is 6.2 KV.

22. a) Consider the 3 bus system shown in figure 4. each of the three lines has a series impedance of 0.02+j0.08 pu and a total shunt admittance of j0.02 pu. The specified quantities at the buses are tabulated below.

Bus	Real load demand	Reactive load demand	Real power generation	Reactive power generation	Voltage specification
1	2	1	-	-	1.04
2	0	0	0.5	1	-
3	1.5	0.6	0	-	1.04

Controllable reactive power source is available at bus 3 with the constraint Q min = 0 and Qmax = 1.5 pu. Find the load flow solution after first iteration using the Gauss – Seidel method with an acceleration factor of 1.7

(OR)

b) Expalin in detail the Newton raphson method of load flow analysis with neat flow chart.

23. a) A 3 phase fault with a fault impedance of j0.16 pu occurs at bus3 in the network. Using the Z bus method, compute the fault current, the bus voltages and the line currents during the fault as shown in figure 5.

(OR)

b) Explain the step by step method of bus impedance matrix formulation algorithm.

24. a) Derive the expression for average 3 phase power in terms of symmetrical components.

(OR)

b) (i) Derive the expression a double line to ground fault.

(ii) A 25 MVA, 13.2 KV alternator with solid grounded neutral has a subtransient reactance of 0.25 pu. The negative and zero sequence reactance are 0.35 and 0.1 pu. Determine the fault current when slg fault occurs at its terminals.

25. a) (i) Derive the swing equation. (10)

(ii) Explain an application of equal area criterion. (4)

(OR)

a) Expalin the methods to improve the stability of power systems.

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