Roll No. **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (EE) PT (Sem.–9)

POWER SYSTEM ANALYSIS

Subject Code : BTEE-801

Paper ID : [75642]

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. Answer briefly :

a) "*The single line diagram is concise representation of power system*". Justify the statement.

b) What are the advantages of per unit computations?

c) What is difference between Z_{bus} and Y_{bus}?

d) Why Gauss-Seidel method is used only for systems having small number of buses?

e) Which fault is more severe if it occurs at generator terminals and why?

f) Write equations to determine the sequence components for unbalanced system of currents?

g) Why load- flow is important in operational and planning stages of power distribution system?

h) Why is resistance generally neglected in fault calculations?

i) Why swing equation of power system is derived?

J) Why power system stability is also referred to as synchronous stability?

SECTION-B

2. Derive load flow algorithm using Newton-Raphson method with flow chart and discuss the advantages of the method.

3. Show that positive and negative sequence currents are equal in magnitude but out of phase by 180° in a line to line fault. Draw a diagram showing inter connection of sequence networks for this type of fault.

4. Discuss the principle of symmetrical components. Derive the necessary equations to convert phase quantities into symmetrical components.

5. For the network shown in Fig., assemble the Z_{bus} matrix by Z_{bus} building algorithm. Add the elements strictly in the following sequence as shown in figure 1.

   Reference to bus 1, Reference to bus 2, bus 2 to bus 3, bus 1 to bus 4 and bus 3 to bus 4.

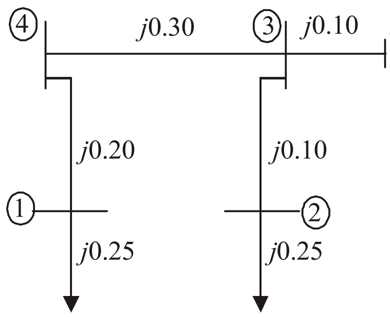

Figure - 1

6. A three phase, 37.5 MVA, 33 kV alternator having X_1 = 0.18 pu, X_2 = 0.12 pu and X_0=0.10 pu, based on its rating, is connected to a 33 kV overhead line having $X_1 = X_2$ = 6.3Ω, X_0=12.6Ω. A single line to ground fault occurs at the remote end of the line. The alternator neutral is solidly grounded. Calculate fault current.

SECTION-C

7. Write a short note on system modeling of synchronous machines.

   A 300 MVA. 20 kV, 3 phase generator has sub transient reactance 20%, The generator is connected to two synchronous motors through 64 km transmission line having transformers on both sides. The transformer on generator side is of 3 phase type with 350 MVA. 20/230 kV. 10% reactance and on the motor side of the transmission line is of three, single phase transformer each rated for 100MVA. 127/13.2 kV with 10% reactance. The reactance of the transmission line 0.5Ω/Km Draw the reactance diagram by selecting generator rating as base values.

8. How swing equation is numerically solved? Clearly mention assumptions, write step by step procedure and conclusions drawn?

9. Two large synchronous systems are interconnected by a transmission line over which there is a power transfer. State the 'two machine' simplifying assumptions and then derive the equal area criterion. Discuss briefly how this can be applied when there is a sudden change in load which might cause instability.