[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
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16305(D) - 0 DEC 2016

B. Tech 8th Semester Examination

Computer Applications to Power System Analysis (NS)

EE-422

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all subparts of the questions in Section E. Use of non-programmable calculator is allowed.

SECTION - A

1. (a) Explain in detail the system viewpoint regarding computer aided power system analysis. (10)

   (b) What do you understand by a single line diagram of a power system and what is its importance? How can you construct a single line diagram for a three phase power system network? (10)

2. (a) Derive the expression for Ybus matrix in terms of topology matrices. (10)

   (b) For the transmission network shown in Figure 1, the lines 2-3 have half line charging admittances of j0.005 and j0.01, respectively in p.u. Write the Ybus matrix by inspection. The shunt capacitor at bus(4) has an admittance j0.02. (10)

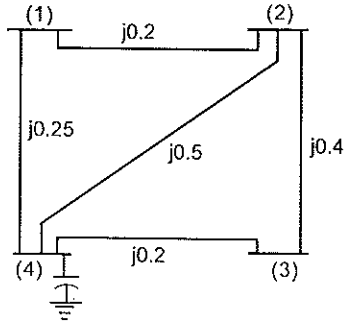

Figure 1

SECTION - B

3. Derive the equations for the total fault current in terms of symmetrical components and phase quantities for the following faults at bus p for a general system.

   (i) Three-phase (not grounded) (ii) line to line and (iii) line to line to ground. (20)

4. The positive sequence network of a three bus power system is shown in Figure-2. The three port description of the generator transmission network is given to be

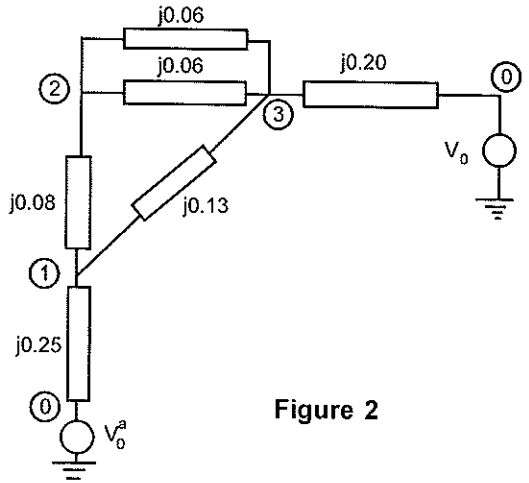

Figure 2

$$\begin{bmatrix} V1 \\ V2 \\ V3 \end{bmatrix} = j \begin{bmatrix} 0.1274 & 0.1061 & 0.0981 \\ 0.1061 & 0.1345 & 0.1151 \\ 0.0981 & 0.1151 & 0.1215 \end{bmatrix} \begin{bmatrix} I1 \\ I2 \\ I3 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} V_0^a$$

For a symmetrical three-phase to ground fault with Z_F=j0.1 p.u., find the fault currents for faults at buses 1, 2 and 3. For faults at bus 1, find all the bus voltages and line currents. Assume $V_0^a = 1 + j0$. (20)

[P.T.O.]

SECTION - C

5. What is load flow solution? Explain its significance in power system analysis. (20)

6. Explain clearly with a flow chart the computational procedure for load flow solution using Newton-Raphson method when the system contains all types of buses. (20)

SECTION - D

7. Derive swing equation and discuss its application in study of power system stability. (20)

8. A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 500% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described. (20)

SECTION - E

9. (i) What is a single line diagram?

   (ii) What are the components of power system?

   (iii) Define load bus and give its importance.

   (iv) List the factors that affect the transient stability

   (v) State drawbacks of Newton Raphson method.

   (vi) Give applications and limitations of equal area criterion.

   (vii) Give criterion for selection of breakers.

   (viii) What is bus admittance matrix?

   (ix) Give a list of shunt type faults.

   (x) What is optimal ordering? (2×10=20)