Code: 15A02603

R15

B.Tech III Year II Semester (R15) Supplementary Examinations December/January 2018/19

POWER SYSTEM ANALYSIS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define Cut set and Tie set.
(b) Define primitive network.
(c) Write the equation for the bus admittance matrix.
(d) List the various types of shunt and series faults.
(e) What is the need for load flow study?
(f) What is the need for slack bus?
(g) List the quantities specified and the quantities to be determined from load flow study for various types of buses.
(h) How the convergence of N-R method is speeded up?
(i) Define swing curve. What is the use of swing curve?
(j) Give the expression for critical clearing time.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Derive the formula for Z_{bus} using building algorithm if the element is a branch with mutual coupled to other element.

(b) Describe the procedure for modifications of Z_{bus} when a line with mutual impedance is added.

OR

3 Determine the incidence matrices A, A^1, B, B^1, C, C^1 and K. From that verify the following relations for shown in figure below, take 1 as reference bus: (i) $C_b = -B_L^T$. (ii) $A_b K^T = U$.

Four bus system

UNIT – II

4 (a) Show that the per unit equivalent impedance of a two winding transformer is the same whether the calculations is made from H.V side or the L.V side.

(b) Explain the comparison between p.u system and actual system in power system.

OR

5 (a) What is the importance to study the short circuit analysis? Discuss the possible causes of short circuits in the power system.

(b) Determine short circuit MVA at the bus bars of a generating station 400 MVA and other station is 200 MVA. The generated voltage of each station is 12 kV. Also find the possible short circuit MVA at each station when they are linked by an inter connected cable with a reactance of 0.6 Ω.

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UNIT – III

6 (a) Explain the necessity of power flow studies in power system and list out the power flow methods.
(b) Explain computation of losses and injected power (real and reactive power) in a load flow study and derive its equations.

OR

7 (a) Write short notes on data for power flow studies.
(b) Write an algorithm for Gauss Seidel load flow method when P-V buses are present.

UNIT – IV

8 (a) Formulate the N-R load flow problem with respect to rectangular form. Explain its solution..
(b) Writ the advantages and disadvantages of N-R method over Gauss Seidel method.

OR

9 (a) With neat flow chart, explain the computational procedure for load flow solution using fast decoupled method when the system contains all types of buses.
(b) What is Jacobian matrix? How the elements of Jacobian matrix are computed?

UNIT – V

10 (a) Explain the classical methods for improving power system stability.
(b) A 20 MVA, 50 Hz generator delivers 20 MW over a double circuit line to an infinite bus. The generator has kinetic energy of 2.52 MJ/MVA at rated speed. The generator transient reactance is X_d = 0.30 pu. Each transmission circuit has R = 0 and a reactance of 0.2 pu on a 20 MVA base. E' = 1.1 pu and infinite bus voltage V = 1 pu. A three phase short circuit occurs at the midpoint of one of the transmission lines. plot swing curves with fault cleared by simultaneous opening of breakers at both ends of the line at 2.5 cycles.

OR

11 (a) Explain equal area criterion with respect to stability with neat sketch.
(b) Explain critical clearing time and critical clearing angle by deriving its expressions.

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