Code: 15A02603 **R15**

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018

**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) Write the most important mode of operation of power system and mention the major problems encountered with it.
(b) Define node and branch.
(c) What is bus admittance matrix?
(d) What is the need for short circuit studies or fault analysis?
(e) What is power flow study or load flow study?
(f) Why do we go for iterative methods to solve load flow problems?
(g) Mention (any) three advantages of N-R method over G-S method.
(h) Mention the advantages of bus admittance matrix.
(i) Define steady state stability.
(j) What are the assumptions made in solving swing equation?

**PART – B**

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

**UNIT – I**

2 Derive self and mutual impedances for addition of link between two old buses and between reference bus and old bus with mutual coupling.

**OR**

3 Define the following and explain with suitable examples.
(i) Oriented graph. (ii) Tree. (iii) Link. (iv) Loop. (v) Cut set.

**UNIT – II**

4 (a) What is reactor? Explain the importance of reactors in power system and list out its advantages.
(b) Obtain the reactance diagram of the given power system network. Choose base quantities has 5 MVA, 33 KV.

Generator : 30 MVA, 10.5 KV, X" = 1.6 Ω
Transformers $T_1$ & $T_2$ : 15 MVA, 33/11 KV, X = 15 Ω referred to HV
Transmission line : 20 Ω/Ph
Load : 40 MW, 6.6 KV, 0.85 lag.

**OR**

5 (a) What are the assumptions made in short circuit studies of a large power system network and explain briefly?
(b) Explain the need for current limiting reactors and their location in a power system.

**UNIT – III**

6 (a) Explain the load flow solution with P-V buses using G-S method (both algorithm and flow chart).
(b) Derive the static load flow equations in a power system.

**OR**

7 (a) Explain the determination of bus voltages, injected active and reactive power that can be computed in load flow studies.
(b) Explain the use of acceleration factors in G-S method.

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**UNIT – IV**

8 (a) Explain the step by step computational procedure for the Newton-Raphson method of load flow studies.
(b) Distinguish between Newton-Raphson and Gauss-Seidel methods of load flow analysis.

**OR**

9 (a) Explain the significance of slack bus. How voltage controlled bus is handled in N-R method in polar form.
(b) List out the types of buses in load flow studies and what are P.V busses. How they are handled in Newton Raphson method.

**UNIT – V**

10 (a) Briefly explain the power system stability considerations and its classification.
(b) What is Swing equation and derive the Swing equation of a synchronous machine.

**OR**

11 (a) What is equal area criterion and explain its effect on stability with neat sketch?
(b) A generator operating at 50 Hz delivers 1 pu power to an infinite bus through a transmission circuit in which resistance is ignored. A fault takes place reducing the maximum power transferable to 0.5 pu whereas before the fault, this power was 2.0 pu and after the clearance of the fault, it is 1.5 pu. By the use of equal area criterion, determine the critical clearing angle.

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