Printed Pages : 1 Roll No. | | | | | | | | | | | NEE601

B.TECH.

THEORY EXAMINATION (SEM–VI) 2016-17

POWER SYSTEM ANALYSIS

Time : 3 Hours *Max. Marks : 100*

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. **Explain the following:** **10 x 2 = 20**

(a) Discuss the representation of a power system network by reactance diagram.

(b) Discuss advantages and disadvantages of per unit system.

(c) Rank the various faults that can occur in power system in the order of severity.

(d) What is infinite bus?

(e) Prove that $1+ \alpha + \alpha^2 = 0$. The symbols having their usual meanings.

(f) Define the symmetrical components.

(g) Define inertia constant of a synchronous machine and write the unit for inertia constant.

(h) Write the power angle equation of a synchronous machine connected to an infinite bus.

(i) What is meant by voltage surge?

(j) What is meant by a lightning arrester?

SECTION – B

2. **Attempt any five of the following questions:** **5 x 10 = 50**

(a) Define the terms per unit voltage, per unit impedance and per unit volt-amperes. Express per unit impedance in terms of base MVA and base KV for a three phase system.

(b) Discuss the various strategic locational aspects of reactors for limiting the fault current and their advantages.

(c) Two generators rated at 10 MVA, 13.2KV and 15MVA, 13.2KV, respectively are connected in parallel to a bus. The bus feeds two motors rated at 8MVA and 12MVA respectively. The rated voltage of motors is 12.5 KV. The reactance of each generator is 15% and that of each motor 20% on its own rating. Assume 50MVA, 13.8KV base and draw reactance diagram.

(d) Discuss the principle of the symmetrical components. Derive the necessary equation to convert phase quantities into symmetrical components

(e) The line to ground voltages on the high voltage side of a step up transformer are 100 KV, 33 KV and **38** KV on phases a, b and c respectively. The voltage of phase a leads that of phase b by 100^0 and lags that of phase c by 176.5^0. Determine analytically the symmetrical components of voltage.

(f) Explain the inertia constant and swing equations. Explain the terms swing curves in power system stability.

(g) Discuss the factors which affect transient state stability of a power system.

(h) **Write short notes any two of the following:**

(i) Synchronous machine (ii) Doubling Effect (iii) Transmission lines

SECTION – C

Attempt any two of the following questions: **2 x 15 = 30**

3. Derive the expression for the symmetrical components of fault current of a power system for L-L fault through impedance. A 30 MVA, 11 KV generator has $Z_1=Z_2= j0.2$ pu, $Z_0=j0.05$ pu. A-line to ground fault occurs on the generator terminals. Find the fault current and line to line

voltages during fault conditions.

4. What is the necessity of load flow study in a power system? What is Newton-Raphson method? How it is applied for the solution of power flow equation? Explain with the help of an example.

5. Develop wave equation for an uniform transmission line and find the velocity of its propagation. Derive the expression for reflection and refraction coefficients of voltage and current waves when a line terminated through a resistance or a cable.