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B. TECH.
(SEM VI) THEORY EXAMINATION 2018-19
POWER SYSTEM ANALYSIS

Time: 3 Hours *Total Marks: 70*

Note: 1. Attempt all Sections. If required any missing data, then choose suitably.

SECTION A

1. Attempt all questions briefly. **2 x 7 = 14**

(a) Give the advantages of per unit system.
(b) Draw the zero sequence network of delta-delta connection.
(c) Name the symmetrical and unsymmetrical faults.
(d) What are the advantages of Y_{bus} over Z_{bus}?
(e) Differentiate between stability and instability.
(f) On what factor does maximum power transfer depend?
(g) What is meant by voltage surge?

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

(a) Discuss the representation of a power system network by reactance diagram show that the per unit impedance of a transformer computed from primary or secondary side is same if the voltage base on two sides are in the ratio of transformation.
(b) Discuss the various stragic location aspects of reactors of limiting the fault current and their advantages.
(c) Classify and explain the various types of buses of a power system used in power flow analysis?
(d) Explain step by step method of system stability with suitable diagrams.
(e) A 300 KV, 5 μ Sec rectangular surge travels along the line terminated by a capacitor of 1500 pF. Determine the voltage across the capacitance and reflected voltage wave if the surge impedance loading of line is 300 ohm.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

(a) A 200 MVA, 11 KV, 3-phase generator has a sub-transient reactance of 10%.The generator supplies a number of synchronous motors over a 34 KM transmission line having transformers at both end in one line diagram. The motors all rated 12.2 KV, represented by just two equivalent motors. Rated inputs to the motors are 300 MVA and 200 MVA for M_1 and M_2 respectively. For both motors X'' = 30%. The three phase transformers T_1 is rated 350 MVA, 220(delta)/11(star grounded) KV with leakage reactance of 10%. Transformer T_2 is composed of three single phase transformers each rated 127(star grounded)/12.2(delta) KV, 300 MVA with leakage reactance of 10%. Series reactance of transmission line is 0.2 Ω/KM. Draw the reactance diagram with all reactance's marked in per unit. Select the generator rating as base in generator circuit.
(b) A generator supplying an unbalanced load measures the following phase to ground voltages. $V_a = 16.0\angle 0^0$ KV, $V_b = 15.0\angle -152^0$ KV, $V_c = 10.0\angle 100^0$ KV. Find the symmetrical components of the set of phase voltages.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) What do you understand by instantaneous maximum momentary current for line? Explain it with the help of suitable diagram and drive condition of doubling effect.

(b) For a single line to ground fault at the terminals of an unloaded generator, positive sequence current was found to be 50 A. Determine sequence currents in phase b and c.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Develop and explain the load flow equation by Gauss Method.

(b) Form Y_{bus} for 4-bus system. If the line series impedances are as follows:

Line (bus to bus)	Impedance
1 – 2	0.13 + j 0.4 pu
1 – 3	0.1 + j 0.6 pu
1 – 4	0.15 + j 0.5 pu
2 – 3	0.05 + j 0.2 pu
3 – 4	0.06 + j 0.3 pu

Neglect shunts capacitance of line.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) What is transient stability? Describe different methods of improving transient stability of a power system.

(b) Explain equal area criterion for stability by taking a suitable example of power system.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) (i) Discuss protection of equipments and line against travelling waves.
(ii) Explain surge impedance and velocity of propagation of travelling waves

(b) Derive the expression for reflection and refraction coefficients of voltage and current waves when a line terminated through a resistance or a cable.