TEE-601 1041

Even Semester Examination 2018-19

B. Tech. (Electrical and Electronics Engg.) (SEMESTER-VI)

POWER SYSTEM ANALYSIS

Time: 03:00 Hours **Max Marks :100**

Note: Attempt **all** questions, the marks assigned to each question is indicated at question itself

1. Attempt **any four** parts. (5×4=20)

   (a) The positive, negative and zero sequence reactance of a 20 MVA, 13.2 KV synchronous generator are 0.3 pu, 0.2 pu, and 0.1 pu respectively. The generator is solidly grounded and is not loaded. A line-to-ground fault occurs on phase a. Neglecting all resistance, determine the fault current.

   (b) Why do refer to analyze unsymmetrical faults by symmetrical component methods?

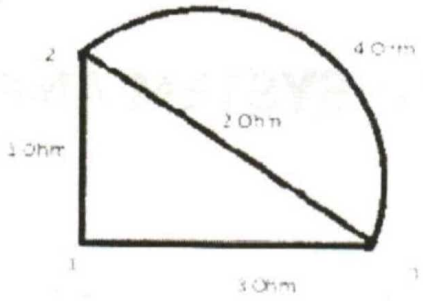
   (c) Mention two main objective of short circuit analysis. Draw a zero-sequence network for a star connected generator with zero sequence impedance Zg0 when the neutral is grounded through impedance Zn.

   (d) What do you understand by short-circuit KVA? Explain. And also explain the transient in R-L circuit of transmission line due its impedances.

   (e) A three- phase, wye- connected, 6.25 KVA, 220 V synchronous generator has a reactance of 8.4 ohm per phase and armature current 4.1 Amp. Using the rated KVA and Voltage as base values, determine the per-unit value of reactance and armature current. Then refer these per-unit values to a 230 V, 7.5 KVA as base.

2. Attempt **any four** parts. (5×4=20)

(a) Explain the Z Bus algorithm with all types of modifications. Calculate Z bus for following 3- bus power system diagram using Z Bus algorithms.



(b) A 20 MVA, 6.6 KV star connected generator has positive, negative and zero sequence reactance of 30%, 25% and 7% respectively. A reactor with 5% reactance based on the rating of the generator is placed in the neutral to ground connection. A line-to-line fault occurs at the terminals of the generator when it is operating at rated voltage. Find the fault current.

(c) Derive the formula for fault current, fault-bus voltages and current through the lines for a 3-phase symmetrical fault at a bus in a power system using Zbus.

(d) What are steps used to find Ybusmatrix? Take a suitable example for explanation.

(e) Bus voltage at bus-1 and bus-2 in atwo-bus power system with a purely reactive transmission line between bus-1 and bus-2 are $1.05\angle -10^0$ and $1\angle 0^0$ respectively. In what direction real and reactive power will flow? Explain why?

3. Attempt **any two** parts. (10×2=20)

(a) A synchronous generator and motor are rated as 30MVA, 13.2KV and both have sub- transient reactance of 20%. The line connecting them has a reactance of 10% on the same base of machine rating. The motor is drawing 20 MW at 0.8 leading P.F and terminal voltage of 12.8 KV when a symmetrical three phase fault occurs at the motor terminals. Find the sub-transient current in the generator, motor and fault by using the internal voltage of the machine.

(b) Draw the flowchart for load flow solution by Gauss Seidel Iterative method and explain.

(c) The following is the system data for a load flow solution:

The line Admittance:

Bus From	code To	Admittance
1	2	2-j8.0
1	3	1-j4.0
2	3	0.666-j2.664
2	4	1-j4.0
3	4	2-j.80

The schedule of active and reactive powers

Bus Code	P	Q	V	Remarks
1	_	_	1.06	Slack
2	0.5	0.2	1+j0.0	PQ
3	0.4	0.3	1+j0.0	PQ
4	0.3	0.1	1+j0.0	PQ

Determine the voltage at the end of first iteration using Gauss-Seidel method. Take $\alpha = 1.6$.

4. Attempt **any two** parts. (10×2=20)

(a) With the neat algorithm, explain the computational solution for load flow solution using Newton-Raphson iterative method when the system contains all types of buses.

(b) Describe equal area criteria for transient stability analysis in power system.

(c) Derive swing equation for a synchronous machine used for stability studies in power system.

5. Attempt **any two** parts. (10×2=20)

(a) Derive wave equation for uniform transmission lines.

(b) How to protect power system equipment against travelling waves? Explain indetail.

(c) Discuss the behavior of travelling wave when it reaches.

(i) Short circuit transmission line and

(ii) Line terminated with an inductance.

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