

Code No: A4901

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY 2012

POWER SYSTEM DYNAMICS

(ELECTRICAL POWER ENGINEERING)

Time: 3hours

Max.Marks:60

Answer any five questions

All questions carry equal marks

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1. a) A 60 Hz, 6 pole generator with $H = 4.0$ p.u supplying 1 p.u. electrical power at an internal voltage of 1.2 p.u and is connected to an infinite bus having voltage of 1.0 p.u through a line of 0.3 p.u reactance. Find the power angle. A three phase short circuit occurs on the line. Use point by point method. The swing curve data of δ and t up to three intervals with step size of 0.05 sec.
- b) State the assumptions used in applying the equal area criteria to a single machine connected to infinite bus.
2. a) Obtain the direct axis equivalent circuit of the synchronous machine.
- b) Discuss the following:
 - i) Remarks of flux linkage transformation.
 - ii) Calculation of transient and sub-transient quantities from equivalent circuit parameters.
3. a) Draw the block diagram and the saturation characteristics of the following exciters.
 - i) Type DC1 – DC commutator exciter
 - ii) Type AC 1 exciter
- b) A generator is connected to an infinite bus through an external impedance of jx_e . If $E_b = V_{to} = 1.0$ p.u. Find the initial conditions. Assume $x_e = 0.28$ p.u. Consider the generator data: $x_d = 1.8$, $x_q = 1.72$, $x'_d = 0.18$, $x'_q = 0.25$, $R_a = 10.0$, $T''_d = 0.52$ sec, $T''_q = 0.1$ sec, $H = 6$ Sec and $f_B = 50$ Hz.
4. a) From the fundamentals obtain the expressions for k_1 , k_2 , and k_3 .
- b) Explain about synchronizing and damping torque analysis application case 2.
5. Discuss the following:
 - i) Analyzing of single machine infinite bus system with and without PSS.
 - ii) Basic concepts in applying PSS
6. a) Explain in detail about the point by point method of solution for transient stability.
- b) Show that C_p is power invariant.
7. Explain in detail with the equations, how the single machine system is analyzed.
8. Explain the following
 - i) Calculation of Initial conditions.
 - ii) Simplified representation of Excitation control.