BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

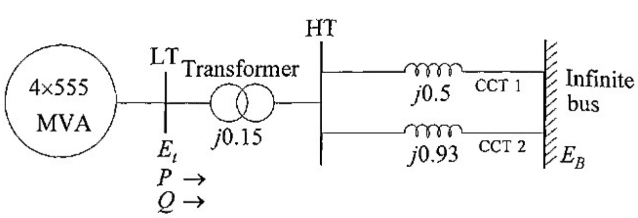
CLASS: M.TECH. **SEMESTER : II**
BRANCH: ELECTRICAL ENGINEERING (POWER SYSTEM) **SESSION : SP/2025**

SUBJECT: EE539 POWER SYSTEM DYNAMICS

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions, each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have the correct question paper.
5. Tables/Data handbook/Graph paper, etc., to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Discuss the different levels of control in the power system.	[5]	1	2
Q.1(b)	What do you understand by rotor angle and voltage stability?	[5]	1	2
Q.2(a)	Write the equation for transforming the current in the abc phase variable into the dqo variables. Explain the physical interpretation of the dqo transformation.	[5]	2	3
Q.2(b)	A 555 MVA, 24 kV, 0.9 pf, 50 Hz, 3-phase, 2-pole synchronous generator has the following inductances and resistances associated with the stator and field windings: L_{aa} = 3.2758+0.0458cos(2Θ) mH, L_{ab} = -1.6379-0.0458cos(2Θ+Π/3) mH L_{afd} = 40.0cosΘ mH, L_{ffd} = 576.92 mH, R_a = 0.0031 Ω, R_{fd} = 0.0715 Ω Determine L_d and L_q in henrys. If the stator leakage inductance l_l is 0.4129 mH, determine L_{ad} and L_{aq} in Henrys.	[5]	2	4
Q.3(a)	Explain the working of AC excitation systems. How is it modelled?	[5]	3	3
Q.3(b)	What are the functions and requirements of an excitation system? Give a block diagram and explain each element of the excitation system.	[5]	3	3
Q.4(a)	How is the load modelled for stability?	[5]	4	4
Q.4(b)	Develop the model for the static load in the power system.	[5]	4	4
Q.5(a)	Explain small signal stability and its different types. Explain the different factors affecting it.	[5]	5	3
Q.5(b)	The figure shows a thermal generating station consisting of four 555 MVA, 24 kV, 60 Hz units. The network reactance shown in the figure is in per unit on a 2220 MVA, 24 kV base. The pre-fault system condition in per unit on the 2220 MVA 24 kV base is P=0.9, Q=0.3 overexcited, E_t = 1.0, 36 degree, E_B = 0.995 zero degree, X_d' = 0.3 and H=3.5MW s/ MVA. Write the linearized equation of the system. Determine the eigenvalues, damped frequency of oscillation in Hz, damping ratio and undamped natural frequency for K_D = 0.	[5]	5	4



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