PAPER ID-310079

Roll No: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

BTECH
(SEM VII) THEORY EXAMINATION 2024-25
POWER SYSTEM DYNAMICS AND CONTROL

TIME: 3 HRS   **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**

Q no.	Question	CO	Level
a.	Define power system stability and its types.	1	K2
b.	What are the states of operation in power systems?	1	K2
c.	What is Park's Transformation?	2	K2
d.	Define per-unit quantities and their advantages in power system analysis.	2	K2
e.	What is the purpose of excitation system modeling?	3	K2
f.	Draw a block diagram of an excitation system.	3	K2
g.	Define small signal stability in power systems.	4	K3
h.	What is the significance of the Routh-Hurwitz criterion in system stability analysis?.	4	K3
i.	Define the function of a washout circuit in a PSS.	5	K2
j.	List the control signals used in PSS.	5	K2

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**

a.	Explain the concept of power system stability and the associated challenges	1	K2
b.	Discuss the steady-state performance analysis of synchronous machines.	2	K2
c.	Explain the measurement techniques for high DC voltages.	3	K2
d.	Perform a small signal analysis of a single-machine system with a block diagram representation.	4	K3
e.	Explain the basic concepts of applying Power System Stabilizers (PSS).	5	K2

SECTION C

3. **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Discuss the problems related to system dynamics in power systems.	1	K2
b.	Derive and analyze the steady-state stability limit of a power system.	1	K2

4. **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Derive the equivalent circuit of a synchronous machine and explain its components.	2	K2
b.	Explain the method to determine the parameters of the equivalent circuits of a synchronous machine.	2	K2

5. **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Derive the state equations for a synchronous machine model.	3	K2
b.	Explain the dynamics of a synchronous generator connected to an infinite bus.	3	K2

6. **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Derive the characteristic equation for a single-machine system and apply the Routh-Hurwitz criterion.	4	K3
b.	Explain the synchronizing and damping torque analysis in detail.	4	K3

7. **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Discuss the structure and tuning methods of PSS.	5	K2
b.	Analyze the role of a washout circuit in PSS and its functionality.	5	K2