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BTECH
(SEM VII) THEORY EXAMINATION 2024-25
POWER SYSTEM OPERATION & 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 SCADA and mention its key functions.	1	K1
b.	What is the role of PMUs in power systems?	1	K1
c.	Mention the key difference between static and dynamic response in load frequency control.	2	K2
d.	What is the primary objective of load frequency control?	2	K2
e.	What is the purpose of an Automatic Voltage Regulator (AVR) in a power system?	3	K3
f.	Define voltage stability and mention its significance.	3	K3
g.	What is the significance of unit commitment in power systems?	4	K3
h.	Define penalty factor and its role in optimal power flow.	4	K3
i.	Define the Generation Shift Distribution Factor (GSDF).	5	K2
j.	What is the purpose of state estimation in power systems?	5	K2

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

Q no.	Question	CO	Level
a.	Describe the architecture and working of SCADA and EMS in power systems.	1	K1
b.	Explain the tie-line power modeling and block diagram representation of a two-area load frequency control system.	2	K2
c.	What are the methods of reactive power compensation? Explain shunt and series compensation.	3	K3
d.	Explain hydrothermal scheduling and its significance in power system operations.	4	K3
e.	Explain the three-state model of power system security and its transition.	5	K2

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

Q no.	Question	CO	Level
a.	Summarize the power scenario of the Indian grid and its operational hierarchy.	1	K1
b.	Explain the role and responsibilities of National and Regional Load Dispatch Centers.	1	K1

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

Q no.	Question	CO	Level
a.	Analyze the importance of load frequency control in maintaining system stability.	2	K2
b.	Explain the modeling of a turbine speed governing system in a single-area load frequency control system.	2	K2

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

Q no.	Question	CO	Level
a.	Draw and explain the schematic and block diagram of an Automatic Voltage Regulator (AVR).	3	K3
b.	Discuss the different types of excitation systems and their controllers used in power systems.	3	K3

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

Q no.	Question	CO	Level
a.	What is optimal power flow? Discuss its formulation and application in power systems.	4	K3
b.	Discuss the constraints involved in the optimal operation of thermal units with and without transmission losses.	4	K3

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

Q no.	Question	CO	Level
a.	Discuss the operating states of a power system and their relevance to power system security.	5	K2
b.	Analyze the role of distribution factors in maintaining power system reliability during outages.	5	K2