16789

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(EE)]-2021
Course Name – Power System Dynamics & Control
Course Code - PE- EE801B
(Semester VIII)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the one required to enhance the system stability of an ac transmission system of mesh network, a FACTS controller can be used, taking into consideration;

a) the continuous ratings (in kW/MW) of all the transmission lines
b) the emergency ratings (in kW/MW) of only the overloaded line
c) the continuous ratings (in kW/MW) of only the overloaded line
d) the continuous ratings (in kW/MW) of only the under loaded line

(ii) State the consequence of voltage instability.

a) Voltage collapse.
b) Power outages.
c) Damage to equipment.
d) All of the these.

(iii) State the significance of the critical clearing time in transient stability studies;

a) The maximum time a fault can be cleared without loss of synchronism.
b) The minimum time required to clear a fault.
c) The time taken for the system to return to its steady state after a disturbance.
d) The duration of the fault.

(iv) Select: In a transmission line, the surge impedance loading (SIL) is the;

a) Voltage at which corona occurs
b) Maximum allowable line loading
c) Load at which reactive power is balanced
d) Frequency of resonance in the line

(v) Select: In an induction machine, what happens if the slip becomes zero.

a) The rotor speed equals synchronous speed
b) The machine generates power
c) The rotor speed becomes zero
d) The stator current increases

(vi) Select: In a HVDC system, which component converts AC to DC.

a) Inverter
b) Rectifier
c) Converter transformer
d) Reactor

(vii) Select the typical role of a STATCOM in a wind farm.

a) Provide frequency support
b) Compensate reactive power
c) Regulate turbine speed
d) Prevent system oscillations

(viii) Select: In load modeling, a constant power load maintains;

a) Constant real power irrespective of voltage
b) Constant reactive power
c) Variable power depending on frequency
d) Zero reactive power

(ix) Indicate: Small disturbance stability analysis is used to study;

a) Frequency collapse
b) Large system disturbances
c) Voltage collapse
d) System behavior for minor changes in load or generation

(x) Indicate the main challenge in solving stiff systems using numerical integration.

a) Slow convergence
b) High computational cost
c) Instability due to large time steps
d) Lack of model accuracy

(xi) Indicate: A slow transient in a power system is typically associated with;

a) Generator rotor dynamics
b) Excitation system response
c) Load shedding
d) Transformer inrush current

(xii) Indicate: numerical integration method is best suited for stiff systems.

a) Explicit Euler Method
b) Runge-Kutta Method
c) Trapezoidal Method
d) Predictor-Corrector Method

(xiii) Choose: Voltage stability in a Single Machine Load Bus System is mainly influenced by;

a) Line resistance
b) Generator inertia
c) Load reactive power demand
d) System frequency

(xiv) Choose: The Sub-Synchronous Resonance (SSR) phenomenon typically occurs in systems with;

a) HVDC lines
b) Large thermal power plants
c) Series-compensated transmission lines
d) Wind farms with induction generators

(xv) Choose the tool that is commonly used for transient stability analysis in power systems.

a) Newton-Raphson Load Flow Solver
b) Time-Domain Simulation Programs
c) State Estimation Algorithms
d) Economic Dispatch Programs

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the changes in excitation affecting the reactive power output of a synchronous machine. (3)
3. Define the concept of equilibrium in a dynamical system. (3)
4. Discuss about the different faults in power system. (3)
5. Explain the ways of representing the eigenvalues of a linear system in modal analysis. (3)
6. Distinguish between small disturbance stability and large disturbance stability. (3)

OR

Summarize the implications of slow and fast transients when modeling a dynamical system. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Infer the significance of the center of inertia (COI) in frequency stability analysis. (5)
8. Explain the different models of transmission lines based on their lengths. (5)
9. Describe current transformer in distribution network (5)
10. Deduce swing equation for power system stability. (5)
11. Write the main criteria mentioned in equal area criteria based graphical approach. (5)
12. Develop the concept of steady-state analysis of a synchronous machine. (5)

OR

Develop the short-circuit transient behavior of a synchronous machine. (5)

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