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BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(EE)-2023

Course Name – Power Quality & FACTS

Course Code - PE-EE602B

(Semester VI)

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) Select the the basic purpose of AC transmission
 - a) Generate electrical power
 - b) Transmit electrical power
 - c) Store electrical power
 - d) Convert electrical power
- (ii) Identify that the line parameter reduced by series compensation by
 - a) Resistance
 - b) Inductance
 - c) Reactance
 - d) Capacitance
- (iii) Identify the type of compensation provided by TCSC.
 - a) Shunt
 - b) Series
 - c) Hybrid
 - d) Passive
- (iv) 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
- (v) Identify the role of shunt capacitance in AC lines is to
 - a) Absorbs reactive power
 - b) Supplies reactive power
 - c) Reduces resistance
 - d) Improves power factor only
- (vi) Identify the main reason for voltage instability.
 - a) Active power mismatch
 - b) Reactive power deficiency
 - c) High resistance
 - d) Load imbalance
- (vii) Choose: The characteristic impedance of a transmission line is primarily determined by;
 - a) Line resistance and conductance
 - b) Line length and voltage
 - c) Line inductance and capacitance
 - d) Frequency and load power factor
- (viii) Choose: A static VAR compensator (SVC) is primarily used for;

- a) Frequency control
- b) Voltage regulation
- c) Active power generation
- d) Line protection
- (ix) 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
- (x) Select: The Ferranti effect is most pronounced in;
 - a) Short transmission lines
 - b) Long lightly loaded lines
 - c) Lines with low voltage
 - d) Lines with high load demand
- (xi) 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
- (xii) Identify the controlled variable in DSTATCOM.
 - a) Voltage only
 - b) Current
 - c) Frequency
 - d) Power angle
- (xiii) Identify DVR connection type.
 - a) Shunt
 - b) Series
 - c) Parallel
 - d) Hybrid
- (xiv) 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
- (xv) Identify series active filter role is to
 - a) Current compensation
 - b) Voltage compensation
 - c) Frequency control
 - d) Power generation

Group-B

(Short Answer Type Questions)

3 x 5=15

- 2. List the main parameters affecting AC transmission performance. (3)
- 3. Apply STATCOM for midpoint voltage regulation in a transmission line. (3)
- 4. Apply CBEMA curve to assess equipment tolerance. (3)
- 5. Describe current control techniques used in DSTATCOM. (3)
- 6. Analyze the harmonic generation issues in thyristor-based FACTS devices. (3)

OR

Analyze the role of TCSC in damping power oscillations. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

- 7. Evaluate the limitations of uncompensated AC transmission for long-distance power transfer. (5)
- 8. Illustrate the power-angle characteristic of an uncompensated transmission line. (5)
- 9. Explain the operating principle of a Thyristor Controlled Reactor (TCR). (5)
- 10. Apply CBEMA curve to assess equipment tolerance. (5)
- 11. Analyze voltage sag mitigation using DVR. (5)
- 12. Explain the different types of angular stability in multi-machine systems. (5)

OR

Infer the impact of series compensation on system stability. (5)