WORK SHEET

UNIT-V
Harmonics

1. Harmonics in HVDC systems are mainly generated due to:
   A) Rotating machines only
   B) Converter switching action
   C) Transmission towers
   D) Insulator leakage

   Answer: B

2. Harmonics are frequencies that are:
   A) Lower than fundamental frequency
   B) Equal to the fundamental frequency
   C) Integral multiples of the fundamental frequency
   D) Random frequencies only

   Answer: C

3. In HVDC converters, characteristic harmonics depend mainly on:
   A) Weather conditions
   B) Pulse number of converter
   C) Tower height
   D) Earth resistance

   Answer: B

4. The characteristic harmonic order in a converter is generally given by:
   A) $n = p$ B) $n = kp \pm 1$
   C) $n = 2p$ D) $n = p/2$

   Answer: B

5. In a 6-pulse converter, the lowest characteristic harmonic is:
   A) 3rd
   B) 5th
   C) 7th
   D) 11th

   Answer: B

6. In a 12-pulse converter, the lowest characteristic harmonic is:
   A) 5th
   B) 7th
   C) 11th
   D) 13th

   Answer: C

7. Non-characteristic harmonics are mainly caused by:
   A) Ideal converter operation
   B) System imbalance and control errors
   C) Transformer cooling
   D) Conductor resistance

   Answer: B

8. One adverse effect of harmonics is:
   A) Improved insulation life
   B) Excessive heating in equipment
   C) Reduction in losses always
   D) Elimination of noise

   Answer: B

9. Harmonics in power systems may cause:
   A) Communication interference
   B) Resonance problems
   C) Additional losses
   D) All of the above

   Answer: D

10. Increasing pulse number in converters generally:
    A) Increases lower order harmonics
    B) Reduces harmonics
    C) Has no effect on harmonics
    D) Eliminates all harmonics completely

    Answer: B

11. Voltage harmonics are mainly produced due to:
    A) Harmonic currents flowing through system impedance
    B) Mechanical vibrations
    C) Transformer oil heating
    D) Atmospheric pressure

    Answer: A

12. Current harmonics in HVDC systems originate mainly from:
    A) AC generators only
    B) Converter operation
    C) Grounding resistance
    D) Bus bar arrangement

    Answer: B

13. Filters in HVDC systems are mainly used to:
    A) Increase frequency
    B) Reduce harmonic distortion
    C) Increase conductor size
    D) Improve insulation strength only

    Answer: B

14. AC filters are generally connected:
    A) In series with DC lines
    B) In parallel with AC bus
    C) Across smoothing reactors
    D) In series with converters

    Answer: B

15. A single tuned filter is designed to suppress:
    A) All harmonics equally
    B) One specific harmonic frequency
    C) Only DC components
    D) Fundamental frequency

    Answer: B

16. High-pass filters are mainly used for:
    A) Low-frequency harmonics only
    B) Higher order harmonics
    C) DC current filtering
    D) Voltage regulation only

    Answer: B

17. Which component combination is commonly used in harmonic filters?
    A) RLC components
    B) Transformer and generator
    C) Fuse and relay
    D) Circuit breaker and isolator

    Answer: A

18. The quality factor of a single tuned filter affects:
    A) Harmonic filtering performance
    B) Tower height
    C) Transformer efficiency only
    D) Line voltage only

    Answer: A

19. Harmonic distortion is commonly measured using:
    A) Power factor
    B) THD (Total Harmonic Distortion)
    C) Slip factor
    D) Diversity factor

    Answer: B

20. One major advantage of using filters in HVDC systems is:
    A) Reduction of harmonic interference and improved power quality
    B) Increase in transmission frequency
    C) Elimination of converters
    D) Reduction in conductor diameter

    Answer: A