

30. a. Discuss the characteristics of harmonics generated by different types of industrial load and commercial load. 12 1 3 1

(OR)

b. What are the devices used for controlling harmonic distortion and explain their function. 12 1 3 1

31. a.i. Explain the various instruments used for power quality measurements. 6 1 4 1

ii. What are the factors to be considered when selecting the instruments? 6 1 4 1

(OR)

b. Explain the functionalities involved in power quality analyzer. Also comment how it contributes for power quality improvement. 12 1 4 1

32. a. Assume that PV farm of 5 MW is connected with the existing power grid, with neat diagrams, explain various power quality issues that emerges due to this integration. 12 1 5 1

(OR)

b. Discuss about various types of contemporary distributed generation technologies. 12 1 6 1

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B.Tech. DEGREE EXAMINATION, MAY 2023

Sixth Semester

18EEE314T – POWER QUALITY

(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- (ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 1. Lightning and Tree striking on a live conductor is an example of _____ power quality issue.
(A) Voltage sag (B) Voltage swell
(C) Interruption (D) Surge | 1 | 1 | 1 | 1 |
| 2. The transients in the power system occurs for _____.
(A) Less than two complete cycles (B) Exactly two complete cycles
(C) Less than one complete cycle (D) Exactly one complete cycle | 1 | 1 | 1 | 1 |
| 3. Which one is the short time reduction in the rms voltage between 0.1 to 0.9p.u for a duration of 0.5 cycle to 1 min?
(A) Voltage distortion (B) Voltage sag
(C) Voltage degradation (D) Voltage swell | 1 | 2 | 1 | 1 |
| 4. In which IEEE standards recommended practice for monitoring, electric power quality is given
(A) IEEE 519 (B) IEEE 1159
(C) IEEE 518 (D) IEEE 241 | 1 | 2 | 1 | 1 |
| 5. The most common way to calculate voltage is from _____.
(A) Average voltage (B) Peak voltage
(C) RMS voltage (D) Form factor | 1 | 1 | 2 | 1 |
| 6. Voltage dips cannot be caused by which of the following:
(A) Switching on large loads (B) Local and remote faults
(C) Inductive loading (D) Capacitive switching | 1 | 1 | 2 | 1 |
| 7. How to calculate the likelihood of sensitive equipment being subjected to voltage lower than its minimum voltage sag?
(A) Area of vulnerability (B) Ferro-resonant transformer
(C) Magnetic synthesizer (D) Constant voltage transformer | 1 | 1 | 2 | 1 |
| 8. Which of the following is correct for ferro resonant transformer?
(A) It is also called as constant voltage transformer and as isolation transformer
(B) It is also called as voltage and current transformer
(C) It is also called as shunt and series transformer
(D) It is also called as isolation and core less transformer | 1 | 2 | 2 | 1 |

9. A steady state deviation from an ideal sine wave of power frequency is
(A) Voltage magnification (B) Voltage distortion
(C) Waveform distortion (D) Under voltage
10. When analyzing a non sinusoidal waveform, it is important to know the _____ of the harmonic components present.
(A) Magnitude and phase angle (B) Phase angle only
(C) Magnitude only (D) Firing angle only
11. Harmonics can be eliminated by introducing _____.
(A) Resonant circuit (B) High impedance
(C) Filters (D) Low impedance path
12. Which of the following device is not the source of harmonics?
(A) Arcing device (B) Pure resistance loads
(C) Heating devices (D) Ferromagnetic devices
13. Harmonic distortion analysis _____.
(A) Measures amplitude of each harmonic (B) Measures rms value of all harmonics except fundamental frequency
(C) Measures rms value of each harmonic onscreen of CRO (D) Displays rms value of each harmonic onscreen of CRO
14. Which of the following is not present in the spectrum analyzer?
(A) Swept local oscillator (B) RF amplifier
(C) Sweep voltage generator (D) Slotted live
15. _____ are advanced data acquisition devices for capturing storing and presenting short duration, subcycle power system disturbances.
(A) Transient disturbance analysers (B) Spectrum analyzers
(C) Harmonic analysers (D) Oscilloscopes
16. _____ have sampling rates far higher than transient – disturbance analyzers.
(A) Multimeters (B) Harmonic analyzers
(C) Oscilloscopes (D) Spectrum analysis
17. As clouds cover a photo voltaic array there is a sudden drop in power output. The rate of drop is frequently on the order of _____ percent per second.
(A) 30 (B) 20
(C) 15 (D) 10
18. _____ generation is typically sited several miles from the nearest substation on a feeder that already may have several switched capacitors and a voltage regulator.
(A) Photovoltaic (B) Wind turbine
(C) Fuel cells (D) Combustion turbine

19. _____ distribution generation technology is the least expensive, mature and readily available.
(A) Combustion turbine (B) Wind turbine
(C) Reciprocating gas (D) Fuel cells

20. The usage of _____ is mandatory for power regulation in DG technologies.
(A) Cycloconverter (B) Voltage regulator
(C) Inverter (D) Flicker meter

PART – B (5 × 4 = 20 Marks)
Answer ANY FIVE Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 21. Illustrate about notching in power quality. | 4 | 1 | 1 | 1 |
| 22. List out the need of power quality standards. | 4 | 1 | 1 | 1 |
| 23. Classify different types of voltage sag. | 4 | 1 | 2 | 1 |
| 24. How to estimate voltage sag performance? | 4 | 1 | 2 | 1 |
| 25. Mention the harmonic effects on electronic devices and loads give examples. | 4 | 1 | 3 | 1 |
| 26. List out the various power quality monitoring steps. | 4 | 1 | 4 | 1 |
| 27. What are the various types of electrical system interfaces? | 4 | 1 | 5 | 1 |

PART – C (5 × 12 = 60 Marks)
Answer ALL Questions

- | | Marks | BL | CO | PO |
|--|-------|----|----|----|
| 28. a.i. Discuss in detail about transients. Draw relevant diagrams. | 6 | 1 | 1 | 1 |
| ii. Discuss the following characteristics of power quality issue with neat diagrams.
(i) Short duration variation
(ii) Long duration variation | 6 | 1 | 1 | 1 |
| (OR) | | | | |
| b. Draw and explain the CBEMA curve and ITI curve. | 12 | 1 | 1 | 1 |
| 29. a.i. Explain active series compensator to compensate the voltage sag occurs in power system. | 6 | 1 | 2 | 1 |
| ii. Explain the sources of voltage sag in power system. | 6 | 1 | 2 | 1 |
| (OR) | | | | |
| b. What are the different voltage sag mitigation techniques? Explain in detail. | 12 | 1 | 2 | 1 |