



**KINGS**

COLLEGE OF ENGINEERING



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## **QUESTION BANK**

**SUBJECT CODE & NAME : EE1005 – POWER QUALITY**

**YEAR / SEM : IV / VIII**

### **UNIT – I**

#### **INTRODUCTION TO POWER QUALITY**

##### **PART – A**

1. What is Power Quality?(2)
2. What is the most common power quality Problem? Why has power quality only become an issue in recent years? (2)
3. What are the types of Power quality solutions available on the market today? (2)
4. How can Power quality problems be detected? (2)
5. What are harmonics? How do harmonics affect the electrical system and load? (2)
6. What is Power conditioning and why it is needed? (2)
7. Why noise or transients on the power line causing problems now? (2)
8. Differentiate between power quality, voltage quality and current quality (2)
9. Mention any two major reasons for the increased concern in Power quality. (2)
10. What are the various power quality issues? (2)
11. What is the meaning of power quality disturbances? (2)
12. State at least two reasons for increased power quality concern. (2)
13. Define long duration variations and short duration variations. (2)
14. Define sag and swell (2)

15. Mention the types of sag and swell (2)
16. What are the causes of sags and swell? (2)
17. What condition an interruption can occurs? (2)
18. List the types of interruption and causes of interruption (2)
19. Define waveform distortion. (2)
20. What are the components of waveform distortion? (2)
21. Define total harmonic distortion and write the formula (2)
22. Define total demand distortion (2)
23. Define DC offset, Inter harmonics (2)
24. Define Voltage flicker. (2)
25. Differentiate between under voltage and over voltage (2)
26. What are the causes of over voltages under voltages? (2)
27. Differentiate between impulsive transients and oscillatory transients.(2)
28. What are the types of impulsive transients and causes of impulsive transients.(2)
29. Define voltage unbalance (2)
30. Define CBEMA curve. (2)
31. What represents ITIC curve? (2)
32. What are the main objective of power quality standards? (2)
33. List the four standards available in Power quality (2)
34. Name any two IEEE standards that define power quality. (2)
35. Name any four IEC standards that define power quality. (2)

**PART – B**

1. (a)What are the major power quality issues? Explain in detail (8)  
(b)Define power quality? Explain the reasons for increased concern in power quality. (8)
2. Explain the various types of power quality disturbances and impacts of power quality. (16)
3. (a)Discuss the following characteristics of power quality events
  - (i)Short duration variations.
  - (ii)Long duration variations (8)  
(b)Discuss in detail about transients. (8)
4. Discuss in detail about sags and swells.(16)
5. Explain for the following related with Power quality.
  - (i)Voltage imbalance
  - (ii)Under voltage
  - (ii)Over voltage
  - (iv)Frequency variation (16)
6. Define waveform distortion? Explain the waveform distortion categories (16)
7. What is harmonics ? Explain harmonic distortion with relevant waveforms(16)
8. Explain the following:
  - (i)Total harmonic distortion
  - (ii)Total demand distortion (16)
9. (a)Write the various IEEE and IEC power quality standards. (8)  
(b)Explain the following event based disturbances:
  - (i)Dip
  - (ii)Swell
  - (iii)Transients (8)
10. Discuss about the computer Business Equipment Manufactures Associations(CBEMA).Explain about the events described in the curve. (16)
11. With a waveform sketch, explain the terms
  - (i)Voltage sag

- (ii) Voltage interruption
- (iii) Voltage swells.
- (iv) Sag with harmonics. (16)

12. Explain the following steady state disturbances.

- (i) Magnitude
- (ii) Unbalance
- (iii) Harmonics
- (iv) Flicker. (16)

## **UNIT – II**

### **VOLTAGE SAGS AND INTERRUPTIONS**

#### **PART – A**

1. What is voltage sag. (2)
2. When sag leads interruption? What are the causes of sag? (2)
3. What is semi F47? (2)
4. What parameters should depend upon voltage sag? (2)
5. List some IEEE Standards Associated with voltage sags.(2)
6. What are the sources of sags and interruption? (2)
7. What is the importance of estimating sag performance? (2)
8. Define voltage sag analysis? (2)
9. Name the frequently used voltage sag indices. (2)
10. What are the various factors affecting the sag magnitude due to faults at a certain point in the system? (2)
11. Define voltage sags due to motor starting ? (2)
12. Name the different motor starting methods. (2)
13. How voltage sag can be mitigated? Name the three levels of possible solutions to voltage sag and momentary interruption problems (2)
14. Name any four types of sag mitigation devices.(2)
15. Define Dynamic voltage restorer? What is the important role of DVR? (2)
16. Define active series compensation devices.(2)
17. What is the need of DSTATCOM? What is the main function of DSTATCOM? (2)

18. What is the role of (advantages of )solid state (static)Transfer switch.(SSTS)? (2)
19. How fast transfer switches are used in minimizing the severity of sags? (2)

**PART – B**

1. (a) Discuss the sources of sags and interruption (8)  
(b) Discuss in detail about the sag performance evaluation indices.(8)
2. What is the need of estimating sag performance ? Explain the different methods of estimating voltage sag performance. (16)
3. (a) Explain the sag performance evaluation methods (8)  
(b) Explain the various causes and effects of voltage sags. (8)
4. Explain the following causes of sags.  
(i) Voltage sag due to motor sag  
(ii) Voltage sag due to single line to ground fault.  
(iii) Voltage sag due to transformer energizing. (16)
5. What are the different voltage sag mitigation techniques? Explain in details.(16)
6. (a) Explain the principle of DVR operation used for sag mitigation. (8)  
(b) Discuss in detail about the active series compensator. (8)
7. (a) Explain the operation of distributed static compensator (DSTATCOM) used for sag mitigation. (8)  
(b) Explain the solid state transfer switch with the transfer operation.(8)
8. (a) Explain the procedure for estimating the sag severity indices.(8)  
(b) Mention the standards associated with the voltage sag.(8)
9. Explain the system adapted to estimate the severity of the sag occurred due to various sources.(16)
10. Explain the following sag mitigation techniques.  
(i) Static UPS with minimal energy storage  
(ii) Backup storage energy supply  
(iii) Flywheel with UPS system. (16)
11. Discuss about estimating the cost of voltage sag events.(16)

**UNIT – III**

**OVER VOLTAGES**

**PART – A**

1. Define transient over voltages (2)
2. What are the types of transient over voltages (2)
3. Define impulsive transients. Give example for impulsive transient over voltages. (2)
4. Give examples for oscillatory transient over voltages. (2)
5. What is the effect of capacitor switching transients on network (2)
6. What are the causes of voltage magnification on network (2)
7. Define voltage magnification phenomena?(2)
8. What are the various causes of over voltages? (2)
9. Give the basic principles of over voltage protection of load equipments.(2)
10. What is the need of surge arrestors? (2)
11. Differentiate between transient voltage surge suppressors(TVSS) and surge arrestors.(2)
12. Mention the types of surge arrestors (2)
13. What is metal-oxide surge arrester? (2)
14. What is the need of transmission line arresters? Mention any two benefits of transmission line surge arresters. (2)
15. What is the need of low pass filter in transient protection? (2)
16. What is the need of shunt protectors or surge reduction filters? (2)
17. What is the application of power conditioners in transient protection? (2)
18. Define lightning Phenomena.(2)
19. How over voltages are induced due to lightning.(2)
20. What are the various causes due to lightning over voltages.?(2)

21. What is the range of current induced due to lightning stroke? (2)
22. What is Ferro resonance? (2)
23. What are the problems associated with Ferro resonance? (2)
24. What are the various capacitance produced by power system elements? (2)
25. Give the cable life equation of a function of impulses. (2)
26. List the important types arrestor used in protection of cables.(2)
27. What is the need of PSCAD/EMTDC? (2)
28. How to model a surge arrestor in PSCAD? (2)

**PART – B**

1. What are transient over voltages? Explain the different types of transient over voltages. (16)
2. (a) Draw the CBEMA curve for transient over voltages and explain.(8)  
(b) Explain the problems associated with Ferro resonance (8)
3. (a) What are the different sources of transient over voltages? Discuss the capacitor switching transient.(8)  
(b) What are the important concerns for capacitor bank switching? (8)
4. Define lightning? Discuss in detail about the over voltages due to lightning and the problems associated with it. (16)
5. (a) Explain in detail the mechanism of lightning. (8)  
(b) Explain the phenomena of Ferro resonance.(8)
6. Draw the standardized waveform of the lightning induced voltage. Discuss about the wave shape of the lightning current. (16)
7. (a) What is the need for protection against over voltages? What are the basic principles of over voltages protection of load equipments? (8)  
(b) Explain in detail about various methods to mitigate voltage swells.(8)
8. (a) explain in detail about the surge arrestors and surge suppressors.(8)  
(b) What are the advantages of surge arrestors? Discuss about the application module.(8)
9. Explain the following:
  - (i) Low pass filters.
  - (ii) Power conditioners.
  - (iii) Surge filters. (16)

- 10.(a) Explain about the underground cable system protection.(8)  
(b) Explain in detail about the protection of transformers.(8)
- 11 (a) What are the various lightning protection of over voltage lines? Explain them.  
(8)  
(b) Explain the use of PSCAD in analyzing the Power quality. (8)
- 12.(a) What are the advantages of computer analysis tools? Discuss about PSCAD and EMTP For transient studies.(8)  
(b) Discuss about the models and examples available in PSCAD/EMTDC. (8)

## **UNIT – IV**

### **HARMONICS**

#### **PART – A**

1. Define Harmonics (2)
2. Define true power factor? What is the reason for existence of harmonic distortion? (2)
3. Differentiate between linear loads and non-linear loads. (2)
4. What is voltage and current distortion.(2)
5. What is total Harmonic distortion? (2)
6. What is total demand distortion? (2)
7. Mention at least two causes of harmonics. (2)
8. What is harmonic index? state its significant. (2)
9. Mention the problems created by harmonics and Mention the harmonic effects on devices and loads. (2)
10. What is the effect on transformer due to Harmonics.(2)
11. What is the advantage of three phase converter? What is the disadvantage of 12 pulse drive.? (2)
12. State the different types of inverters.?(2)
13. What is variable voltage Inverter? What is current source inverter(2)
14. Mention the applications of cycloconverter? (2)



15. What is the characteristic of series and parallel resonant circuit? (2)
16. What is the main source of causing resonance in power system?(2)
17. What is the effect of resistive load under resonance frequency in power system?  
(2)
18. What are the philosophies of IEEE 519 standards? What are the objectives of IEEE standard? (2)
19. What are the applications of active and passive filters? (2)
20. What is IEC standard? Give at least two IEC standards for EMC. (2)
21. Give atleast two IEEE standards for power quality? (2)
22. Give the IEEE and IEC standards for EMC. (2)
23. Mention the devices for controlling harmonic distortion? (2)
24. What are the classification of active harmonic conditioner? What is the use of shunt active filter? (2)
25. List the advantages of Active Harmonic Filter? List the some dynamic correction of Power quality events? (2)

### **PART – B**

1. Explain briefly about fundamentals of harmonics generation and waveform distortion. (16)
2. (a) Explain in detail about classification of linear loads and non linear loads used in harmonic studies. (8)  
(b) Explain the concept of harmonic phenomena under the presence of harmonic producing loads.(8)

3. Explain the following terms.
  - (i) Harmonic distortion
  - (ii) Current distortion
  - (iii) Voltage distortion (16)
  
4. (i) What are the two indices used in Power system? Explain about it briefly.(8)  
ii) Give the power definitions under non sinusoidal conditions. Explain briefly about it.(8)
  
5. (a) Explain briefly about various harmonic characterization on power systems (8)  
(b) Explain briefly about the phenomena of how current distortion affects the voltage distortion under the presence of harmonics. (8)
  
6. (a) What are the general causes of harmonics in power systems (8)  
(b) What are the various causes of harmonics in distribution power system.(8)
  
7. (a) List the various effects of equipments due to harmonics. Explain briefly. (8)  
(b) Explain the harmonic effects on power system equipments briefly.(8)
  
8. (a) What are the various classifications of harmonic sources and explain briefly about it. (8)  
(b) Explain Harmonic source Identification Procedure for two source systems. (8)
  
9. Explain for the following:
  - (i) Harmonic sources from commercial loads.
  - (ii) Harmonic sources from industrial loads.
  - (iii) Harmonic sources from residential loads. (16)
  
10. (a) What is the need of locating harmonic sources?(8)  
(b) How will you find the harmonic sources from point of common coupling? Give the identification procedure on the basis of voltage indices.(8)
  
11. (a) Explain the power system response characteristics under the presence of harmonics.(8)  
(b) What is the need of IEEE standards used in harmonic studies.? Give their philosophy and objective of these standards.(8)
  
12. Define for the following terms related with IEEE standards.
  - (i) SCR (ii) Load current (iii) Short circuit current (iv) Total harmonic distortion
  - (v) Total demand distortion (v) PCC (16)
  
13. Explain in detail about general procedure for harmonic distortion evaluation at the point of coupling, utility systems, customer facility and industrial facility (16)

14. What are the various devices for controlling harmonic distortion? Explain briefly about it. (16)

15.(a) Explain briefly about for the following harmonic filter.

(i) Active filters (ii) Passive filters (8)

(b) Explain in detail about principles of operation of shunt active power filter with neat schematic. (8)

## **UNIT – V**

### **POWER QUALITY MONITORING**

#### **PART – A**

1. What are the importance of power quality monitoring?(2)
2. What are the monitoring objectives? (2)
3. What are the purposes of power quality monitoring system? (2)
4. What is proactive monitoring? (2)
5. What is monitor? (2)
6. What are the steps involved in power quality monitoring? (2)
7. What are the requirements of monitoring for a harmonic distortion? (2)
8. Draw the typical block diagram of Measurement system. (2)
9. What are the characteristics of power quality monitoring equipment?(2)
10. What are the characteristics of Power line monitors? (2)
11. What are the types of power quality measurement equipment? (2)
12. Mention the factors that should be considered for selecting the instrument.(2)
13. What is the use of spectrum analyzer? Mention the instruments used for the analysis of non-sinusoidal voltage and currents.(2)
14. Mention the basic categories of instruments for harmonic analysis.(2)
15. What is spectrum analyzer? What is the operation of spectrum analyzer?(2)
16. What is swept heterodyne technique.(2)
17. What is tracking generator? What is harmonic analyzer? (2)

18. Define voltage flicker? What are flicker sources?(2)
19. Define voltage flicker according to IEEE standard 1159?(2)
20. What is expert system? What are the advantages of expert system?(2)
21. Mention the main components of Expert system?(2)
22. What are the components of flicker meter?(2)

**PART – B**

1. (a) Explain Proactive monitoring (8)  
(b) Discuss in detail about the selection of power quality monitoring sites.(8)
2. Bring out the significance of Power quality monitoring. What are the important power quality monitoring objectives.? (16)
3. (a) Bring out the important characteristics of power quality variations. (8)  
(b) Explain the steps involved in power quality monitoring. What are the information from monitoring site surveys.(8)
4. Write short notes on power quality measurement system. What are the characteristics of power quality measurement equipments? (16)
5. Explain the harmonic analyzer and disturbance analyzer. (16)
6. (a) Explain in detail about Flicker meter.(8)  
(b) Application of expert system for power quality monitoring. (8)
7. What are the various instruments used for power quality measurements? What are the factors to be considered when selecting the instruments? (16)
8. (a) Discuss in detail about the instruments used for analyzing non sinusoidal voltage and currents. (16)
9. (a) Explain the modern power quality monitors(8)  
(b) Draw and explain the functional structure of expert systems.(8)

10. Draw the block diagram of advanced power quality monitoring systems. Explain it.. (16)