

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK



VIII SEMESTER

1905806 – Power Quality

Regulation – 2019

Academic Year 2022 – 2023 (Even)

Prepared by

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UNIT I - INTRODUCTION TO POWER QUALITY				
Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients - short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve. Power Quality issues of Grid connected Renewable Energy Sources.				
PART – A				
Q.No	Questions	BT Level	Competence	Course Outcome
1.	Define Power Quality as per IEEE	1	Remember	CO 1
2.	Define Dc offset. Mention its sources in power system.	1	Remember	CO 1
3.	Define power frequency variation.	1	Remember	CO 1
4.	Define the power quality as per IEEE	1	Remember	CO 1
5.	What are the main components of power quality standards?	1	Remember	CO 1
6.	Define momentary interruption and components of waveform distortion	1	Remember	CO 1
7.	Comment” harmonics affect the electrical system”	2	Understand	CO 1
8.	Differentiate inter harmonic and sub harmonics	2	Understand	CO 1
9.	Illustrate about notching in power quality	2	Understand	CO 1
10.	Differentiate between voltage sag and voltage swell	2	Understand	CO 1
11.	Classify the types of power quality solutions available on the market today.	3	Apply	CO 1
12.	How are the power quality problems detected?	2	Understand	CO 1
13.	State the causes for Voltage Fluctuations	1	Remember	CO 1
14.	List out the need of power quality standards	4	Analyze	CO 1
15.	Comment transients or noise on the power line.	4	Analyze	CO 1
16.	What are the reasons voltage imbalances?	4	Analyze	CO 1
17.	Criticize “capacitor switching leads to overvoltage”	5	Evaluate	CO 1
18.	Distinguish sag and swell	5	Evaluate	CO 1
19.	Define Voltage Imbalance	1	Remember	CO 1

20.	List the effects of Voltage Swell	2	Understand	CO 1
21.	Write about the under voltage and overvoltage Problem	2	Understand	CO 1
22.	Find the harmonic distortion of a voltage waveform with following harmonic frequency make up: fundamental=114V, 3 rd harmonic=4V, 5 th harmonic=27V, 7 th harmonic=1.5V and 9 th harmonic=1V	3	Apply	CO 1
23.	What do you mean by power frequency variations in power	6	Create	CO 1
24.	Plot the CBEMA curve	6	Create	CO 1
PART – B				
1.	Discuss about any four power quality issues, indicating more attention in power system. (13)	1	Remember	CO 1
2.	(i) Discuss the following characteristics of power quality issue (7) (a) Short duration variations (b) Long duration variations (ii) Discuss in detail about transients (6)	1 1	Remember Remember	CO 1
3.	(i) Describe the CBEMA and ITI curve (7) (ii) Define waveform distortion and explain the waveform distortion categories (6)	 1	 Remember	 CO 1
4.	Write short notes on following power quality issues (13) (i) Harmonics (ii) Power frequency variations	 1	 Remember	 CO 1
5.	Discuss the source and effects of different categories of long duration voltage variations that affect the power quality (13)	2	Understand	CO 1
6.	Explain power quality and explain the reasons for increased concern in power quality (13)	2	Understand	CO 1
7.	Explain the sources of power quality problems and mention the international standards used for monitoring. (13)	2	Understand	CO 1
8.	Explain the various types of power quality disturbances in power system and also explain the characteristics of each disturbance (13)	3	Apply	CO 1
9.	(i) Summarize the impact of poor power quality on utility and consumers (7) (ii) Discriminate on over voltage and under voltage in power quality issue (6)	3 3	Apply Apply	CO 1 CO 1
10.	Describe the objective of power quality standards and Discuss about IEEE and IEC Standards used for power quality issues (13)	4	Analyze	CO 1

11.	(i) Explain total harmonic distortion and total demand distortion (7) (ii) Discuss the standards of power quality (6)	4	Analyze	CO 1
12.	(i) Demonstrate the major reasons for the growing concern about the quality of electric power by both electric utilities and end users (7) (ii) Illustrate the principle phenomenon causing electric magnetic disturbance classified by International Electro technical commission (6)	6	Create	CO 1
13.	With a waveform sketch, explain the terms (13) (a) Voltage sag (b) Voltage interruption (c) Voltage swells (d) Sag with harmonics	5	Evaluate	CO 1
14.	(i) Discuss about the Computer Business Equipment Manufactures Associations (CBEMA) curve. Explain the events described in the curve. (7) ii) Differentiate between power quality, voltage quality and current quality (6)	2	Understand	CO 1
15.	Discuss about an over voltage and under voltage in power quality Line with neat Waveforms. (13)	1	Remember	CO 1
16.	Write short notes on following power quality issues (13) (i) Voltage Fluctuations (ii) Voltage Imbalance	1	Remember	CO 1
17.	Describe about the Computer Business Equipment Manufactures Associations (CBEMA) curve. Explain the events described in the curve (13)	2	Understand	CO 1
PART – C				
1	Draw the CBEMA Curve and explain the significance of the term used in it. (15)	4	Analyze	CO 1
2	Discuss in detail about transients and waveform distortion related to the power quality (15)	5	Evaluate	CO 1
3	Explain briefly about international standard of power quality (15)	4	Analyze	CO 1
4	Explain the various types of power quality disturbances (15)	5	Evaluate	CO 1
5	Discuss the Power Quality issues of Grid connected Renewable Energy Sources.	5	Evaluate	CO 1
PART – D				

UNIT II - VOLTAGE SAGS AND SWELL

Estimating voltage sag performance. Thevenin's equivalent source- Analysis and calculation of various faulted condition. Estimation of the sag severity - Mitigation of voltage sags, Static transfer switches and fast transfer switches. Capacitor Switching-Lightning –Ferro resonance –Mitigation of voltage swell.

PART – A

Q.No	Questions	BT Level	Competence	Course Outcome
1.	When sag leads to interruption	1	Remember	CO 2
2.	List out the causes of sag.	1	Remember	CO 2
3.	List out the three levels of possible solutions to voltage sag and momentary interruption problems.	1	Remember	CO 2
4.	List some industry standards associated with voltage sags.	1	Remember	CO 2
5.	What are the various factor affecting the sag magnitude due to faults at a certain point in the system.	1	Remember	CO 2
6.	Classify different types of voltage sag.	2	Understand	CO 2
7.	List out the faults in the Power System	1	Remember	CO 2
8.	How to estimate voltage sag performance	3	Apply	CO 2
9.	Describe the importance of voltage sag estimation	2	Understand	CO 2
10.	Demonstrate how voltage sag can be mitigated and list the types to mitigation devices.	2	Understand	CO 2
11.	Demonstrate the causes for voltage sags due to transformer.	1	Remember	CO 2
12.	Write the use of static transfer switch.	2	Understand	CO 2
13.	Explain static transfer switch.	3	Apply	CO 2
14.	Design the active low pass filter to mitigate the voltage swell.	6	Create	CO 2
15.	Name the different motor starting methods.	2	Understand	CO 2
16.	Describe the Area of vulnerability	2	Understand	CO 2
17.	Write the Procedure to assure compatibility between the supply system characteristics and the facility operation	3	Apply	CO 2
18.	Write about the lightning Phenomenon	2	Understand	CO 2
19.	Summarize the main function of DSTATCOM	4	Analyze	CO 2
20.	What are the main functions of DVR	5	Evaluate	CO 2
21.	List the Causes of Ferro resonance	3	Apply	CO 2
22.	Analyze the Capacitor Switching	5	Evaluate	CO 2
23.	Define Voltage Swell	4	Analyze	CO 2
24.	Analyze effects of Voltage Swell	6	Create	CO 2
PART – B				
1.	(i) Explain the sources of sags in power system (7)	1	Remember	CO 2
	(ii) Discuss the sources of interruption to affect the power quality (6)	1	Remember	CO 2

2.	(i) Describe in detail about the sag performance evaluation indices. (7)	1	Remember	CO 2
	ii) Describe the methodology of estimating voltage sag performance (6)	1	Remember	CO 2
3.	Explain the following causes of sag (13) a) Voltage sag to motor b) Voltage sag due to single line to line fault c) Voltage sag due to single line to ground fault	3	Apply	CO 2
4.	(i) Explain various indexes used to estimate voltage sag (7) (ii) Discuss some of the solutions for voltage sag and interruption (6)	2	Understand	CO 2
5.	Explain the causes of long interruptions and the principle of regulating the voltage. (13)	2	Understand	CO 2
6.	Analysis and calculation of power quality due various faulted condition (13)	2	Understand	CO 2
7.	(i) Explain performance voltage sag due to starting of large induction motor in distribution level (7) (ii) How does the load influence on voltage sag adjustable speed drives? (6)	4 6	Analyze Create	CO 2 CO 2
8.	Explain the operation of Distribution Static Compensator (DSTATCOM) used for sag mitigation (13)	4	Analyze	CO 2
9.	Explain how voltage sag performance is estimated in power system network. (13)	5	Evaluate	CO 2
10.	(i) Explain active series compensator to compensate the voltage sag occurs in power system (7) (ii) Explain how ferro resonance transformer to improve the voltage sag performance (6)	3	Apply	CO 2
11.	(i) Explain the solid state transfer switch with transfer operation (7) (ii) Explain fast transfer switch with transfer operation (6)	3	Apply	CO 2
12.	(i) What are the different voltage sag mitigation techniques? Explain the principle of operation of DVR used for sag mitigation (7) (ii) Analyze about estimating the cost of voltage sag events in the power system (6)	6 1	Create Remember	CO 2 CO 2
13.	Explain any two voltage sag mitigation Techniques with necessary circuit diagram and waveform (13)	4	Analyze	CO 2
14.	Explain the role of compensators in mitigation of voltage sags. (13)	5	Evaluate	CO 2

15.	Explain about the Series Active compensator with neat diagram (13)	4	Analyze	CO 2
16.	Discuss in detail about the Capacitor switching. (13)	4	Analyze	CO 2
17.	Discuss about the Lightning Phenomenon and also about the functions of lightning arrester. (13)	4	Analyze	CO 2
PART – C				
1	Describe the procedure for estimating motor switching voltage sag. (15)	5	Evaluate	CO 2
2	Discuss the effects of voltage sag and interruption on various electrical equipment. (15)	5	Evaluate	CO 2
3	What are the different voltage sag mitigation sag techniques? Explain in detail. (15)	5	CO 2
4	Briefly explain static transfer switches and fast transfer switches. (15)	4	Analyze	CO 2
5.	Explain about working principle of DSTATCOM (15)	5	Evaluate	CO 2

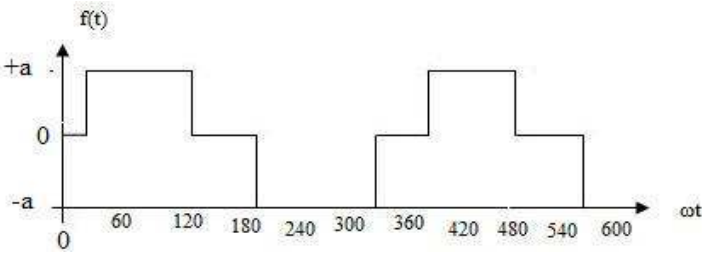
UNIT III- HARMONICS

Harmonic sources from commercial and industrial loads, locating harmonic sources. Power system response characteristics - Harmonics Vs transients. Effect of harmonics - harmonic distortion - voltage and current distortion - harmonic indices - inter harmonics – resonance. Harmonic distortion evaluation. IEEE and IEC standards.

PART – A

Q.No	Questions	BT Level	Competence	Course Outcome
1.	State the different between harmonics and transients	3	Apply	CO 3
2.	Define point of common coupling (PCC).	1	Remember	CO 3
3.	Mention the harmonic effects on devices and loads.	2	Understand	CO 3
4.	Analyze the objectives of IEEE and IEC standards?	5		CO 3
5.	Why even harmonics are normally absent in the power converters?	3	Apply	CO 3
6.	Define harmonics.	1	Remember	CO 3
7.	Interpret about Total Demand Distortion (TDD)?	2	Understand	CO 3
8.	What are the sources of harmonic distortion?	3	Apply	CO 3
9.	Define Total harmonic distortion	1	Remember	CO 3
10.	Summarize the advantage of three phase converter	5	Evaluate	CO 3
11.	Write the need of locating harmonic sources	1	Remember	CO 3
12.	Point out the sources of harmonics from industrial loads	4	Analyze	CO 3
13.	Interpret about Harmonic indices	2	Understand	CO 3

14.	Differentiate between linear loads and nonlinear loads	2	Understand	CO 3
15.	Compose the difference between harmonics and inter harmonics	6	Create	CO 3
16.	Infer voltage and current distortion?	4	Analyze	CO 3
17.	Point out the effects of harmonics	4	Analyze	CO 3
18.	What is the significance of power quality indices	1	Remember	CO 3
19.	Differentiate between Harmonics and Transients	1	Remember	CO 3
20.	List out the devices employed for controlling the harmonics in the power system	1	Remember	CO 3
21.	Write down the few IEEE and IEC Standards for Power quality issues.	2	Understand	CO 3
22.	Examine the inter harmonics	4	Analyze	CO 3
23.	Prepare the IEEE standard for harmonic level in distribution system.	6	Create	CO 3
24.	Name the devices for controlling harmonic distortion	1	Remember	CO 3
PART – B				
1.	Explain the methods to evaluate harmonic distortion (13)	4	Analyze	CO 3
2.	(i) Explain the IEEE and IEC standards on harmonics distortion. (7) (ii) What are the filters in harmonic analysis? Explain active and passive filters (6)	3 3	Apply Apply	CO 3 CO 3
3.	(i) Explain briefly how the phenomena of current distortion affects the voltage distortion under the presence of harmonics (7) (ii) Explain briefly about locating harmonic sources and characterization in power system (6)	4 4	Analyze Analyze	CO 3 CO 3
4.	(i) Explain the power system response characteristics under the presence of harmonics. (7) (ii) What is the need of IEEE standards used in harmonics studies? Give their philosophy and objectives of these standards (6)	4 1	Analyze Remember	CO 3 CO 3
5.	Explain briefly about the sources of harmonics generation and waveform distortion. (13)	4	Analyze	CO 3
6.	Discuss the effects of harmonics on electrical power components (13)	2	Understand	CO 3
7.	Write short note on IEEE and IEC standards in controlling harmonic distortion (13)	1	Remember	CO 3

8.	Explain how commercial and industrial loads are responsible for harmonic distortion. (13)	5	Evaluate	CO 3
9.	Determine the RMS and THD of the following waveform (13) 	3	Apply	CO 3
10.	Write the principle of controlling harmonics and explain the devices used for it. (13)	1	Remember	CO 3
11.	(i) Explain the waveform distortion due to different types of nonlinear loads (7) (ii) Write short notes on the following (i) Harmonic indices (ii) Inter harmonics (6)	4 2	Analyze Understand	CO 3 CO 3
12.	(i) Write short notes on THD and TDD. (ii) Discuss the effects of harmonic distortion on transformers and motors. (3) (10)	2 2	Understand Understand	CO 3 CO 3
13.	.What is meant by point of common coupling? Generalize the IEEE 519 standard and IEC 61000-3-2 standard with respect to harmonics. (13)	1	Remember	CO 3
14.	.(i) Demonstrate about evaluation of harmonic distortion (7) (ii) Define the following terms related with IEEE standards. (6) a) SCR b) Total harmonic distortion.	3 1	Apply Remember	CO 3 CO 3
15.	Explain about the active filter in controlling harmonic distortion (13)	1	Remember	CO 3
16.	Write short notes on the following (13) (a) Arcing devices (b) Saturable Devices	1	Remember	CO 3
17.	Discuss the effect of harmonics Distortion due to nonlinear load in the power system. (13)	2	Understand	CO 3

PART-C				
1.	What are the devices used for controlling harmonic distortion and explain their function (15)	5	Evaluate	CO 3
2.	Explain briefly about harmonic distortion and conduct an evaluation of study (15)	4	Analyze	CO 3
3.	Explain briefly about the phenomena of how current distortion affects the voltage distortion under the presence of harmonics (15)	6	Create	CO 3
4.	Explain in detail about commercial and industrial loads are responsible for harmonic distortion.			
5.	Explain IEEE and IEC standards for power quality issues (15)	5	Evaluate	CO 3

UNIT IV - PASSIVE POWER COMPENSATORS				
Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction				
PART - A				
Q.No	Questions	BT Level	Competence	Course Outcome
1.	Describe the Reactive power in the transmission Network	1	Remember	CO 4
2.	Define Shunt Passive Compensation	1	Remember	CO 4
3.	Examine the Active and Passive VAR Control	1	Remember	CO 4
4.	Define the Series Compensation	1	Remember	CO 4
5.	Label the load Compensation	1	Remember	CO 4
6.	Summarize the System Compensation	2	Understand	CO 4
7.	Estimate voltage regulation & power factor correction.	2	Understand	CO 4
8.	List out the factors that decide the rating of lossless passive shunt compensators	3	Apply	CO 4
9.	Express the limitations of the series compensation using lossless passive components	2	Understand	CO 4
10.	Discuss Main objective Of Power Passive filters	2	Understand	CO 4
11.	Examine Passive Power Filter	1	Remember	CO 4
12.	Classify the Passive Power Filter	2	Understand	CO 4
13.	What is Hybrid Passive Filters and classify its types	3	Apply	CO 4
14.	Show the Limitations of Passive Filters	3	Apply	CO 4

15.	Classify the factors on which the performance of a tuned passive shunt power filter depends	4	Analyze	CO 4
16.	Summarize Shunt and series Passive Filters	5	Evaluate	CO 4
17.	Generalize the value of quality factor of a tuned passive shunt power filter and on what factors it depends.	6	Create	CO 4
18.	Deduce the lossless passive elements used for shunt and series compensation in an AC supply distribution system	5	Evaluate	CO 4
19.	Classify the passive ripple filters	4	Analyze	CO 4
20.	Design the tuned passive series power filter?	6	Create	CO 4
21.	Explain about the voltage regulation	2	Understand	CO 4
22.	Infer the power factor correction	3	Apply	CO 4
23.	Define Resonance condition in power system	1	Remember	CO 4
24.	Summarize the disadvantage of Passive power filter	5	Evaluate	CO 4
PART – B				
1.	Examine Principle of Operation of Passive Shunt and Series Compensators. (13)	1	Remember	CO 4
2.	Describe the general Classification of Passive Shunt and Series Compensators. (13)	1	Remember	CO 4
3.	Explain about the various types of Shunt and Series Compensation based on the single phase and three Phase Load. (13)	2	Understand	CO 4
4.	Analysis of Shunt Compensators for Power Factor Correction. (13)	4	Analyze	CO 4
5.	Describe Classification of Passive Shunt and Series Compensators. (13)	4	Analyze	CO 4
6.	Explain the Design Procedure of the Passive Shunt Compensators. (13)	4	Analyze	CO 4
7.	Analysis the Design methodology of Shunt Compensators for Zero Voltage Regulation. (13)	6	Create	CO 4
8.	Describe the main Classification of Passive Filters. (13)	1	Remember	CO 4
9.	Examine the Principle of Operation of Passive Power Filters. (13)	3	Apply	CO 4
10.	Illustrate Classification of Passive Filters based on the Connection and Configuration. (13)	3	Apply	CO 4
11.	Explain the following (i) Sharpness of Tuning of Passive Filters (7) (ii) Cost of Passive Filters (6)	2	Understand	CO 4
12.	Explain about the Analysis and Design of Passive Power Filters. (13)	5	Evaluate	CO 4
13.	Explain the Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. (13)	2	Understand	CO 4
14.	Explain about the Fundamental of Load Compensation and its classification. (13)	3	Apply	CO 4

15.	Explain about the voltage Regulation and power factor correction (13)	3	Apply	CO 4
16.	Discuss in detail about the limitation of power passive filter. (13)	2	Understand	CO 4
17.	Explain about the hybrid passive filter and write its classification (13)	2	Understand	CO 4
PART – C				
1.	Design the Model and Performance of Passive Shunt and Series Compensators. (15)	6	Create	CO 4
2.	A single-phase load having $Z_L = (4.0 + j1.0)$ pu is fed from an AC supply with an input AC voltage of 230 V at 50 Hz and a base impedance of 4.15Ω . It is to be realized as a unity power factor load on the AC supply system using a shunt connected lossless passive element (L or C) as shown in Fig. Calculate (a) the value of the compensator element (in farads or henries) and (b) equivalent resistance (in ohms) of the compensated load. (15)	6	Create	CO 4
3.	Summarize the Classification of Passive Filters based on the topology, connection, and the number of phases. (15)	5	Evaluate	CO 4
4.	Generalize the Principle of Operation of Passive Power Filters. (15)	5	Evaluate	CO 4
5	Design the Load Compensator for voltage regulation and power factor correction (15)	5	Evaluate	CO 4

UNIT V - POWER QUALITY MONITORING & CUSTOM POWER DEVICES

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems – quality measurement equipment - harmonic / spectrum analyzer - flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM-DSTATCOM in Voltage Control mode, Current Control mode, DVR Structure-Rectifier supported DVR –DC Capacitor Supported DVR-Unified Power Quality.

PART – A

Q.No	Questions	BT Level	Competence	Course Outcome
1.	What is the role of expert system in power quality studies	1	Remember	CO 5
2.	Define power quality monitoring	1	Remember	CO 5
3.	What is the need for power quality monitoring?	2	Understand	CO 5
4.	What is flicker meter?	1	Remember	CO 5
5.	Describe about signal processing tools for analyzing power quality issues	1	Remember	CO 5
6.	Interpret the benefits of power quality monitoring?	2	Understand	CO 5
7.	List some of the major power quality monitoring equipment's.	2	Understand	CO 5
8.	State and analyse the objectives of power quality monitoring	1	Remember	CO 5
9.	List out the various power quality monitoring steps	3	Apply	CO 5
10	Analyse the merits of digital power quality analyzers?	5	Evaluate	CO 5
11	What is spectrum analyzer?	4	Analyze	CO 5
12	Mention any two signal processing tools for analyzing power quality issues	5	Evaluate	CO 5
13	Infer the power quality disturbance analyzer.	3	Apply	CO 5
14	Describe about DSTATCOM	2	Understand	CO 5
15	Point out the different types of working modes in DSTATCOM	4	Analyze	CO 5
16	Define the structure of DVR.	1	Remember	CO 5
17	Analyse the Voltage Restoration.	4	Analyze	CO 5
18	Define the structure of SVC	1	Remember	CO 5
19	List the main functions of IPFC	2	Understand	CO 5
20	Write down the different types of custom power devices	2	Understand	CO 5
21	Define the structure of IPFC	2	Understand	CO 5
22	Describe the working and different configuration of UPQC	1	Remember	CO 5
23	List the main functions of UPQC	1	Remember	CO 5
24	Write any two IEEE standards to assess the power quality monitoring	6	Create	CO 5
PART – B				
1.	Explain different types of monitoring and diagnostic techniques for various power quality problems. (13)	2	Understand	CO 5
2.	Explain the flicker meter and flicker measurement techniques in details. (13)	3	Apply	CO 5
3.	Explain in detail with necessary diagram the working principle and functioning of power quality analyzers (13)	5	Evaluate	CO 5
4.	Briefly discuss the common objectives of power quality monitoring. (13)	2	Understand	CO 5

5.	(i) Bring out the important characteristics of power quality variations. (7) (ii) Explain the steps involved in power quality monitoring. What are the information from monitoring site surveys? (6)	2 1	Understand Remember	CO 5 CO 5
6.	(i) Explain the various instruments used for power quality measurements. (7) (ii) What are the factors to be considered when selecting the instruments? (6)	1 1	Remember Remember	CO 5 CO 5
7.	Explain the features of spectrum analyzer and flicker meters (13)	3	Apply	CO 5
8.	Design the block diagram of advanced power quality monitoring systems. Explain it in detail. (13)	4	Analyze	CO 5
9.	Discuss the applications of expert systems for power quality monitoring with block diagram. (13)	1	Remember	CO 5
10	(i) Analyze the role and application of expert systems in power quality monitoring (7) (ii) Discuss briefly about the different features of harmonic analyzer (6)	2	Understand	CO 5
11	Describe about the working principle of DSTATCOM and its Application. (13)	4	Analyze	CO 5
12	Explain about the different modes of control mode in DSTATCOM (13)	4	Analyze	CO 5
13	Analyze about the working principle and Structure of DVR. (13)	6	Create	CO 5
14	Explain about (i) Rectifier supported DVR (6) (ii) DC Capacitor Supported DVR (7)	3 3	Apply Apply	CO 5 CO 5
15	Design the block diagram of Interline power flow controller. Explain it in detail. (13)	4	Analyze	CO 5
16	Describe about the working principle of UPFC and its Application. (13)	4	Analyze	CO 5
17	Discuss in detailed manner about the different types of custom power devices used in power quality. (13)	5	Evaluate	CO 5
PART-C				
1	Explain monitoring requirement of different types of power quality variation (15)	4	Analyze	CO 5
2	Explain the steps involved in power quality monitoring. What are the information's from monitoring site survey? (15)	5	Evaluate	CO 5
3	Explain about the structure and different working modes of DSTATCOM. (15)	5	Evaluate	CO 5

4	Explain about the Configuration, Structure and Control of UPQC (15)	4	Analyze	CO 5
5	Explain about the Configuration, Structure and Control of IPFC (15)	4	Analyze	CO 5

