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 2024 – 2025 (Even)

Prepared by

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SUBJECT: 1905806-Power Quality

SEM / YEAR: VIII SEMESTER / ACADEMIC YEAR 2024-2025 (Even)

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, 3rd harmonic=4V, 5th harmonic=27V, 7th harmonic=1.5V and 9th 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**

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 Outco
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) (ii) Discuss the sources of interruption to affect the power quality (6)	1 1	Remember Remember	CO 2 CO 2

2.	(i)Describe in detail about the sag performance evaluation indices. (7) ii)Describe the methodology of estimating voltage sag performance (6)	1 1	Remember Remember	CO 2 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**

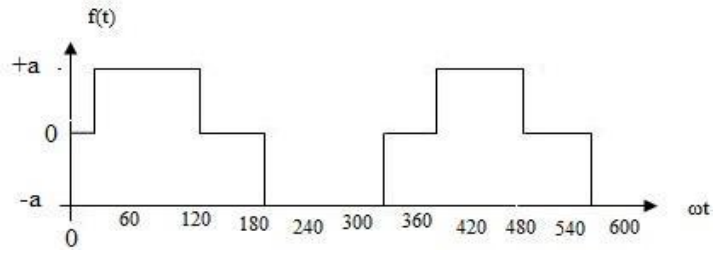
UNIT III- HARMONICS

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. (3) (ii)Discuss the effects of harmonic distortion on transformers and motors. (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**

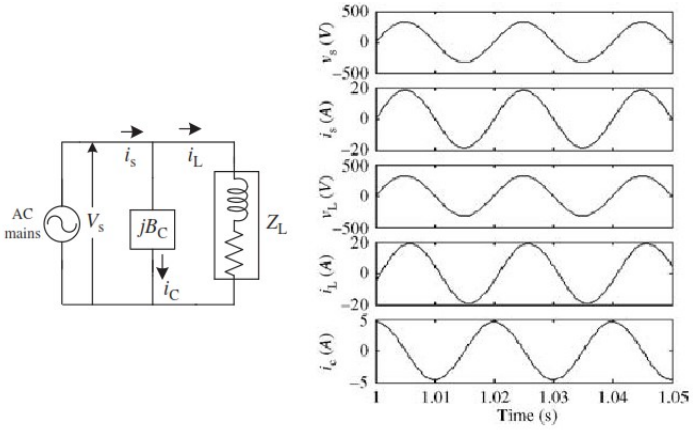
UNIT IV - PASSIVE POWER COMPENSATORS

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 ZL = (4.0 + j1.0) pu is fed from an AC supply with an input AC voltage of230 V at 50 Hz and a base impedance of 4.15 Ω. 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 is 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**