



Course/Branch: B-Tech/Electrical Engineering  
Subject Name: Power Quality and FACTS  
Subject Code: KEE074

Semester: 7<sup>th</sup>  
Max. Marks: 100  
Time: 180 min

- CO-1** : Classify the power quality issues in electrical distribution network.  
**CO-2** : Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS.  
**CO-3** : Describe the different phenomenon causing electrical transients and devices for over voltage protection.  
**CO-4** : Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC  
**CO-5** : Explain the causes of harmonics, its effect on motor, capacitor, cables and mitigation techniques.

**Section – A# 20 Marks (Short Answer Type Questions)**  
Attempt ALL the questions. Each Question is of 2 marks (10 x 2 = 20 marks)

Q. No.	COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks
1 a)	CO1	Explain the term power quality. (K2)
b)	CO1	What are different types of electrical transients that occur in power system? (K1)
c)	CO2	Summarize the source of voltage sag. (K2)
d)	CO2	Demonstrate the diagram of active series compensator. (K2)
e)	CO3	What do you mean by Transformer energizing? (K2)
f)	CO3	What are the sources of transient overvoltage? (K1)
g)	CO4	Explain the Block diagram of UPQC. (K2)
h)	CO4	What are the FACTS controllers? (K1)
i)	CO5	Explain the term Inter-harmonics. (K2)
j)	CO5	What is the main cause of Harmonic distortion? (K1)

**Section – B# 30 Marks (Long / Medium Answer Type Questions)**  
Attempt ALL the questions. Each Question is of 6 marks (5 x 6 = 30 marks)

- Q.2 (CO-1): Explain the different types of waveform distortion. (K2)  
OR  
Define "Interruption". Give its causes. (K1)
- Q.3 (CO-2): Discuss the working of voltage regulator. (K6)  
OR  
Interpret the working of isolation transformer. (K2)
- Q.4 (CO-3): Explain the function of ASDs. (K2)  
OR  
Explain how we can reduce the impact of lightning. (K2)

- Q.5 (CO-4): Discuss the working of custom power devices. (K2)  
OR  
Explain the equivalent diagram of TCSC. (K2)

- Q.6 (CO-5): What are the two important harmonic indices used in power system? Explain them briefly. (K2)  
OR  
Write a short note on the working of harmonic filter. (K2)

**Section – C# 50 Marks (Medium / Long Answer Type Questions)**  
Attempt ALL the questions. Each Question is of 10 marks.

- Q.7 (CO-1): Attempt any ONE question. Each question is of 10 marks.  
a. Explain the transient disturbance. How many types of transients are present? Discuss each type by giving suitable examples. (K2)  
b. Explain how ferroresonant transformer can be used to handle voltage sag conditions. Explain in detail. (K2)
- Q.8 (CO-2): Attempt any ONE question. Each question is of 10 marks.  
a. Explain the principles of voltage sag performance. Give solution at end user level. (K2)  
b. Explain the working of different uninterruptible power supplies. (K2)
- Q.9 (CO-3): Attempt any ONE question. Each question is of 10 marks.  
a. Discuss the atmospheric phenomena causing transient over voltage. (K2)  
b. Compare Capacitor switching transient with UPS switching transients. Discuss the main impact of these events. (K6)
- Q.10 (CO-4): Attempt any ONE question. Each question is of 10 marks.  
a. Compare SSC with SVC. Discuss the main function of these devices. (K6)  
b. Define basic power flow conditions in power analysis. Also state its results. (K2)
- Q.11 (CO-5): Attempt any TWO questions. Each question is of 5 marks.  
a. Write short notes on the benefits of active harmonic filter. (K2)  
b. Explain the individual and total harmonic distortion terms. (K2)  
c. Explain the function of Zig-zag transformer. (K2)