R22 Regulation *Subject code:4P7BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Regular/Supplementary Examinations, October 2026

POWER QUALITY & FACTS

(EEE)

Maximum Marks: 60 Date:30.10.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Define the term 'voltage sag' in a distribution network	1M	1	L1
b)	What is wave-form distortion? List any two types.	1M	1	L1
c)	State the necessity of reactive power compensation in AC transmission lines	1M	2	L1
d)	Distinguish briefly between passive series and shunt compensation.	1M	2	L2
e)	What is a Static VAR Compensator (SVC)?	1M	3	L1
f)	State the basic operating principle of a STATCOM	1M	3	L1
g)	Mention the main objective of a static series compensator.	1M	4	L1
h)	What does SSSC stand for in FACTS technology?	1M	4	L1
i)	Define the primary function of a Unified Power Flow Controller (UPFC).	1M	5	L1
j)	Name the independent parameters controlled by a UPFC system.	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Explain steady-state variations in voltage and frequency within distribution networks. b) Describe the phenomenon of voltage flicker and outline how it is measured.	5M 5M	1	L2 L2
	OR			
3	a) Define harmonics and notching. Discuss their severe impacts on power quality. b) Distinguish clearly between voltage sags and voltage swells with neat waveforms.	5M 5M	1	L2 L2
4	a) Perform a basic analysis of an uncompensated AC transmission line. b) Explain the concept of passive reactive power compensation in transmission systems.	5M 5M	2	L3 L2
	OR			

5	a)Explain the effect of series compensation applied exactly at the mid-point of an AC line. b) Provide a structural and functional comparison between series and shunt compensation.	5M 5M	2	L3 L2
6	a) Discuss the primary objectives of applying shunt compensation in a power network. b) Explain the configuration and working principle of a Thyristor Controlled Reactor (TCR).	5M 5M	3	L2 L2
	OR			
7	a) Describe the operational characteristics and control approaches of a STATCOM. b) Explain the Fixed Capacitor-Thyristor Controlled Reactor (FC-TCR) configuration.	5M 5M	3	L2 L3
8	a) Explain the operating principle and control scheme of a Thyristor Controlled Series Capacitor (TCSC). b) Discuss the power angle characteristics of a Static Synchronous Series Compensator (SSSC).	5M 5M	4	L2 L2
	OR			
9	a) Outline the primary operational principles of a Thyristor Switched Series Capacitor (TSSC) b) Explain the capability of a series compensator to provide active and reactive external control.	5M 5M	4	L2 L2
10	a) Introduce the Unified Power Flow Controller (UPFC) and explain its basic operating principle b) Describe the conventional control capabilities of a UPFC in a multi-line power system.	5M 5M	5	L2 L2
	OR			
11	a) Explain how independent control of real and reactive power is practically achieved using UPFC. b) Summarize the structural arrangement of a combined compensator configuration.	5M 5M	5	L3 L2