R22 Regulation *Subject code: 4P7BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VII Semester Supplementary Examinations, May 2026

POWER QUALITY & FACTS

(EEE)

Maximum Marks: 60 Date:13.05.2026 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 voltage unbalance.	1M	1	1
b)	What is meant by a transient in power systems?	1M	1	1
c)	Differentiate between short and long interruptions.	1M	2	1
d)	State the purpose of series compensation.	1M	2	1
e)	What is meant by controllable VAR generation?	1M	3	1
f)	List the main components of a STATCOM.	1M	3	1
g)	Define variable impedance type compensator.	1M	4	1
h)	What are the advantages of TSSC over TCSC?	1M	4	1
i)	Mention any two control objectives of UPFC.	1M	5	1
j)	Give one practical application of combined compensators	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Discuss different types of voltage variations that affect power quality b) Explain the effects of frequency deviation on electrical loads.	5 5	1	2 2
	OR			
3	a) Analyze how harmonics impact rotating electrical machines b) Describe the sources and effects of DC offsets and notching in voltage waveforms.	5 5	1	2 4
4	a) Derive the power–angle relationship for a compensated transmission line. b) Illustrate how series compensation enhances power transfer capability.	5 5	2	4 2
	OR			
5	a) Explain the behavior of an uncompensated transmission line using phasor diagrams b) Compare series and shunt compensation in AC transmission.	5 5	2	2 2
6	a) Explain the configuration and operation of a Fixed Capacitor–Thyristor Controlled Reactor (FC-TCR). b) Discuss the steady-state and dynamic characteristics of an SVC.	5 5	3	3 3

	OR			
7	a) Describe the voltage–current characteristics of STATCOM under different operating modes. b) Explain how STATCOM improves voltage stability in a transmission system.	5 5	3	4 2
8	a) Explain in detail the control schemes of TCSC for power flow regulation. b) Discuss the operational difference between TSSC and SSSC.	5 5	4	2 2
	OR			
9	a) Analyze the impact of series compensation on system stability and damping of oscillations. b) Write short notes on external control of series compensators.	5 5	4	2 4
10	a) With neat diagram, explain the principle and functional blocks of UPFC. b) Discuss how UPFC mitigates voltage instability in transmission systems.	5 5	5	2 2
	OR			
11	a) Explain the internal control loops of UPFC for regulating power flow b) Evaluate the role of combined compensators in enhancing transient stability.	5 5	5	2 3