

Code No: **R164102F**

**R16**

**Set No. 1**

**IV B.Tech I Semester Regular/Supplementary Examinations, March – 2021**

**ELECTRIC POWER QUALITY**  
(Electrical and Electronics Engineering)

**Time: 3 hours**

**Max. Marks: 70**

*Question paper consists of Part-A and Part-B*

*Answer ALL sub questions from Part-A*

*Answer any FOUR questions from Part-B*

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**PART–A(14 Marks)**

1. a) What is meant by potential power quality problem? [3]  
b) Write short notes on the ground window? [3]  
c) What is meant by voltage flickering? [2]  
d) What are the sources of harmonics in power system? [2]  
e) What is meant by cloud transients? [2]  
f) Write short notes on energy monitors? [2]

**PART–B(4x14 = 56 Marks)**

2. a) Compare the power quality with the voltage quality by using an example? [7]  
b) Explain the attributes used in the steady state phenomenon of the power quality problem? [7]
3. a) Discuss in detail about the equipment sensitivity to the voltage sags? [7]  
b) Explain about the transient over voltages by using necessary expressions? [7]
4. a) Discuss the need and list out the equipment used for the voltage regulation? [7]  
b) A three phase, 50 Hz, 440V motor develops 100 H.P, the power factor is 0.65 lagging and the efficiency is 88%. A capacitors is connected in delta across the supply terminals and the power factor is raised to 0.9 lagging. Each capacitance units is built of four similar 100V capacitors. Find the capacitance of each capacitor? [7]
5. a) Explain about the effective value of harmonic components of a distorted wave? [7]  
b) Discuss how the transformers are getting effected by harmonic distortion? [7]
6. a) Explain the role of fuel cells in the distributed generation? [7]  
b) Write about the synchronous machine interface to the utility system in the distributed generation? [7]
7. a) Explain in detail about the power quality monitoring equipment in the distribution substation? [7]  
b) Discuss about the PQ monitoring standards. [7]

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**Set No. 2**

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**Time: 3 hours**

**Max. Marks: 70**

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*Answer ALL sub questions from Part-A*

*Answer any FOUR questions from Part-B*

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**PART–A(14 Marks)**

1. a) Write short notes on the sustained interruptions? [3]  
b) What is meant by ground electrode? [3]  
c) Write the list of static VAR compensation devices? [2]  
d) What is meant by current distortion? [2]  
e) List out the power quality issues effected by distributed generation? [2]  
f) Write short notes on disturbance analyzer? [2]

**PART–B(4x14 = 56 Marks)**

2. a) Explain the three phase voltage variations for fault interruption and recloser operations with the wave forms? [7]  
b) Explain the attributes used in the non-steady state phenomenon of the power quality problem? [7]
3. a) Explain in detail about the principles of over voltage protection? [7]  
b) Discuss about the sources of voltage sag with examples? [7]
4. a) Explain the causes and effects of voltage flicker in the power system? [7]  
b) A single phase A.C generator supplies the following loads:  
i) Lighting load of 25kW at unity power factor.  
ii) Induction motor load of 122kW at 0.65 power factor lagging.  
iii) Synchronous motor load of 44kW at 0.8 power factor leading.  
Find the total kW and kVA delivered by the generator and the power factor at which it works? [7]
5. a) Explain how the fluorescent lighting will affect the existence of the harmonics? [7]  
b) Discuss how the harmonics will affect the standard shunt power capacitors with an example? [7]
6. a) Explain about the reciprocating engine set of distribution generation? [7]  
b) Discuss about the effect of distribution generation on the voltage regulation with relevant equations? [7]
7. a) Write about the various considerations of power quality monitoring? [7]  
b) Explain in detail about the off line power quality data assessment with wave forms? [7]

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<b>Set No. 3</b>
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**Time: 3 hours**

**Max. Marks: 70**

*Question paper consists of Part-A and Part-B*

*Answer ALL sub questions from Part-A*

*Answer any FOUR questions from Part-B*

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**PART-A(14 Marks)**

1. a) List out the causes for the over voltages? [3]
- b) Write short notes on the crest factor? [3]
- c) What is meant by power factor penalty? [2]
- d) Define total demand distortion? [2]
- e) List out power quality issues. [2]
- f) Write the use of power quality data interchange format? [2]

**PART-B(4x14 = 56 Marks)**

2. a) Discuss any three types of wave form distortions? [7]
- b) Explain about the voltage fluctuations resulted from the arc furnace operation by using the wave forms? [7]
3. a) Discuss about the isolation transformer used for over voltage protection? [7]
- b) Explain about various nonlinear loads which will affect the voltage variations? [7]
4. a) Discuss how the capacitor is used for voltage regulation with necessary equations? [7]
- b) A 3 phase, 8kW induction motor has a power factor of 0.4 lagging. A bank of capacitors is connected in delta across the supply terminals and the power factor is raised to 0.85 lagging. Find the kVAR rating of the capacitors connected in each phase? [7]
5. a) Explain how the arcing devices will affect the harmonics with suitable diagrams? [7]
- b) Discuss in brief about the point of common coupling with an example? [7]
6. a) Write the merits and demerits of the distributed generation? [7]
- b) Explain the role of wind turbines in the distributed generation? [7]
7. a) Explain the role of multi meters in the power quality measurements? [7]
- b) Write about the transducer requirements in the power quality measurements? [7]

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**Set No. 4**

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**Time: 3 hours**

**Max. Marks: 70**

*Question paper consists of Part-A and Part-B*

*Answer ALL sub questions from Part-A*

*Answer any FOUR questions from Part-B*

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**PART–A(14 Marks)**

1. a) What are the causes for under voltages? [3]  
b) Write short notes on area of vulnerability? [3]  
c) Write briefly about the end user capacitor application? [2]  
d) Justify, why the harmonic distortion problem is most significant power quality problem? [2]  
e) Write short notes on the wind farm? [2]  
f) What is an intelligent system? [2]

**PART–B(4x14 = 56 Marks)**

2. a) What is meant by power frequency variation? Explain. [7]  
b) Discuss about the impulse transient by drawing the current–time wave form? [7]
3. a) Discuss about the sources of voltage swell with examples? [7]  
b) Explain the operation of utility surge arrester with diagram? [7]
4. a) Derive the expression for the power factor penalty? [7]  
b) A synchronous motor improves the power factor of a load of 188kW from 0.6 lagging to 0.95 lagging. Simultaneously the motor carries a load of 65kW. Calculate the leading kVAR taken by the motor, kVA rating of the motor and the power factor the motor at which it operates? [7]
5. a) Discuss the role of total demand distortion in the harmonic analysis? [7]  
b) Draw and explain the inductive coupling concept of power system due to harmonic currents? [7]
6. a) Explain the need and the development of distributed generation? [7]  
b) Explain the role of photo voltaic systems in the distributed generation? [7]
7. a) Draw and explain the block diagram of smart power quality monitoring system? [7]  
b) Explain how the current and voltage transducers are used for power quality measurement? [7]