



Subject/Code: **Power Quality in Electrical Power Systems / ELE 715**

This exam measures ILO's no. (A1, A3, A5, B1, B2, B3, C3, C4)

Remarks: No. of pages: 1 No. of questions: 4

Allowed Tables and Charts: (None)

جودة القدرة في نظم القوى الكهربائية

Answer All The Following Questions:

Question 1

[25 Mark]

- Explain the phenomena of voltage dip indicating characteristics, sources and solutions for this phenomenon.
- What are the main sources of voltage unbalance in electrical grid? List two methods for compensating voltage and current unbalance in electrical grids using power electronic devices.
- There are several filtering techniques to mitigate grid harmonics. Explain the different filters schemes used for attenuating harmonics produced by dc-drives. Why we prefer Shunt active power filter than the passive filters.

Question 2

[25 Mark]

- Power quality is defined by common terms. Define first the power quality term and explain the sources of power quality terms. Also, describe the difference between (Crest Factor – Distortion factor), (Flicker - Interruption), (Notch - Sag – Swell).
- In light of power quality issue, describe the definitions of the following terms: Distortion factor- Flicker- Form factor- Harmonic distortion- inrush- Nonlinear load- power factor- displacement factor- distortion factor. Also, give the relation between power factor, displacement factor and distortion factor.
- To solve any power quality problem, it is necessary to understand power quality issues. In the light of this statement, describe, as an overview, the common power quality issues.

Question 3

[25 Mark]

- Voltage unbalance in electrical grid affect the operation of the converter, explain why? What is the source of voltage unbalance and current unbalance? How to compensate them using power electronics devices?
- One of the main disadvantages of power electronic systems is the injection of harmonics in the grid. List three sources of harmonics and explain their contributions on generating harmonics.
- Three phase AC to DC converters are considered one of the main sources of harmonics. Explain the waveforms of different types of converters. Also show the difference between the 6 pulses and 12 pulses converters in term of harmonic order generation.

Question 4

[25 Mark]

- Active and passive filters are commonly used to mitigate harmonic in industrial network. Explain the filter system used for mitigating harmonics produced by dc-drives. List the drawbacks of using passive filters and explain the theory of shunt active power filter and its purpose.
- What is the impact of supply network disturbances on static converters? how converter design could play an important rule to ride through during grid faults

With best wishes

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