

M.E. Second Semester (Electrical Engineering (Electrical Power System))  
**13576 : Power Quality Improvement Techniques : EP 2203**

P. Pages : 2

Time : Three Hours



**AW - 3596**

Max. Marks : 80

- Notes :
1. Answer **three** question from Section A and **three** question from Section B.
  2. Assume suitable data wherever necessary.
  3. Illustrate your answer necessary with the help of neat sketches.
  4. Use of pen Blue/Black ink/refill only for writing the answer book.

**SECTION – A**

1. a) Explain the concept and need of power quality. 6  
b) What are short duration voltage variations? Explain in detail voltage sag with its causes and effects. 7

**OR**

2. What is waveform distortion? Explain in detail the followings. 13  
i) Notching ii) DC off set  
iii) Inter harmonics iv) Noise
3. a) What is non-linear load? Explain how it produces harmonics. 6  
b) Explain the following in detail. 7  
i) Total harmonic distortion. ii) Total demand distortion.

**OR**

4. a) What are harmonics? Explain how voltage distortion takes place at PCC. 6  
b) Explain the measurement of power system quantities under non sinusoidal condition. 7
5. Explain 6-pulse and 12-pulse configurations of converters with their input current waveforms and harmonic spectrum. 14

**OR**

6. a) Explain single phase AC voltage regulator as a source of harmonics. 7  
b) What is integral cycle control? Explain how it causes harmonics. 7

**SECTION – B**

7. a) Discuss effect of harmonics on capacitor banks. 7  
b) Discuss the phenomenon of parallel resonance in presence of harmonics. 7

**OR**

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|----|--|----|
| 8. | Explain the effect of harmonics on the followings.                           | 14 |
|    | i) Power system protection.  |    |
|    | ii) Transformer.   |    |
|    | iii) Power measurement.  |    |
| 9. | a) Explain the criterion for filter design.                                  | 6  |
|    | b) Explain how double tuned filters are helpful in elimination of harmonics. | 7  |

OR

- |     |   |   |
|-----|---|---|
| 10. | a) What are damped filters? Explain their types in brief.   | 6 |
|     | b) Discuss in detail how high power factor converter can eliminate harmonics.                         | 7 |
| 11. | a) Explain with the help of block diagram the operation of shunt active power filter.                 | 7 |
|     | b) What are active power filters? Explain their compensation principle with the help of neat diagram. | 6 |

OR

- |     |   |   |
|-----|---|---|
| 12. | a) Explain constant tolerance band control technique for active power filter.                                       | 6 |
|     | b) Discuss in detail the classification of active power filters on the basis of objective and system configuration. | 7 |

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