Registration no: | | | | | | | | | | |

Total no. of Pages:02 **M.TECH**

 P2PECC09

2nd SEMESTER REGUALR EXAMINATION 2016-17
Power Quality Improvement Techniques
BRANCH: ELECTRI & ELECTRO ENGG (POWER SYSTEM ENGG), ELECTRICAL AND ELECTRO ENGG, ELECTRICAL ENGG., ELECTRICAL POWER SYSTEM, INDUS. POWER;
Q.CODE: Z837
Time: 3 hours
Max. Marks: 100

Answer FIVE questions including Q No. 1 which is compulsory.
The figures in the right hand margin indicate marks.

Q1. **Answer all questions**. [2×10]

a) How does power quality get affected by frequency and voltage variations? Explain.
b) Discuss the various causes for production of harmonics.
c) What is meant by inter harmonics? Explain with a suitable example.
d) What is the effect of DC offset on power quality?
e) What is the role of consumer equipments in maintenance of power quality?
f) Explain how various modes of transformer connection reduces harmonics in a system?
g) Explain the principle of operation of single phase active filter.
h) Explain the principle of operation of power quality conditioners for flicker control.
i) Explain the concept of constant capacitor voltage control mechanism and its application.
j) Explain the operation of single phase active filter.

Q2. a) What is meant by harmonic power? How it is different from the normal power of circuits having sinusoidal voltage and current waveforms? Deduce the expressions for the apparent power in each case. [10]

b) Why the even harmonics are generally not present in a 3-phase balanced AC networks? Justify your answer with appropriate sketches. Also indicate the order of harmonics that may be present in the zero sequence current. [10]

Q3. a) Explain the terms ‘voltage sag’ and ‘voltage swell’ and state the major causes for their occurrence. How do voltage sag and voltage swell affect power quality? Also explain the remedial measures for improvement of power quality. [10]

b) Discuss two possible schemes for elimination or suppression of harmonics present in a system. Hence find out the line currents due to triplen harmonic phase currents in the delta winding of a transformer. [10]

Q4. a) How does parallel and series resonance occurs in a system? Also explain the possible effects of harmonics on series and parallel resonance. [10]

b) Explain with neat diagram the construction and principle of operation of single tuned high pass filter. [10]

Q5. a) What is the need for integral cycle control? Explain a practical method of its application with the help of neat diagram. Also explain the operating principle of a cycloconverter. [10]

b) What are the effects of harmonic interference on control system equipments and protection equipments? Explain each case briefly. [10]

Q6. a) Explain the advantages of unified power quality conditioner over the conventional equipments used for improvement of power quality. Also differentiate between voltage source and current source configuration in respect of unified power quality conditioner operation. [10]

b) Differentiate between active filters and passive filters. Also draw the input current waveforms and harmonic spectrum of 12-pulse converters. [10]

Q7. a) Explain the effect of harmonics on static power plants and hence compare the three techniques described by constant frequency control, constant tolerance band control and variable tolerance band control. [10]

b) How do the harmonics affect the operation of transmission lines? Also explain the role of capacitor banks in a power system. Also explain the role of arc furnace and battery chargers for harmonic production. [10]
