प्रज्ञानं ब्रह्म
Manipal
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Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

KNOWLEDGE IS POWER
MANIPAL INSTITUTE OF TECHNOLOGY

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: POWER QUALITY ISSUES [ELE 445]

REVISED CREDIT SYSTEM

Time: 3 Hours   08 December 2015   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ANY FIVE FULL** questions.
❖ Missing data may be suitably assumed.

1A. Explain briefly the classification of low frequency disturbances in Power systems. How these disturbances can be cured using isolation transformers & voltage regulators   **06**

1B. Explain briefly the types, causes & classification of oscillatory voltage transient? What are the different strategies employed to reduce oscillatory voltage transients   **04**

2A. A 2000-kVA, 13.8-kV to 480/277-V, 60 Hz 3 phase transformer with a leakage reactance of 6.0% feeding a bus containing two 500-hp adjustable speed drives with dominant 5th, 7th & 11th harmonics as shown in figure.1 A 750-kVAR Y-connected capacitor bank is installed on the 480-V bus for power factor correction. Perform an analysis to determine the conditions for resonance. Suggest how this resonance condition can be avoided
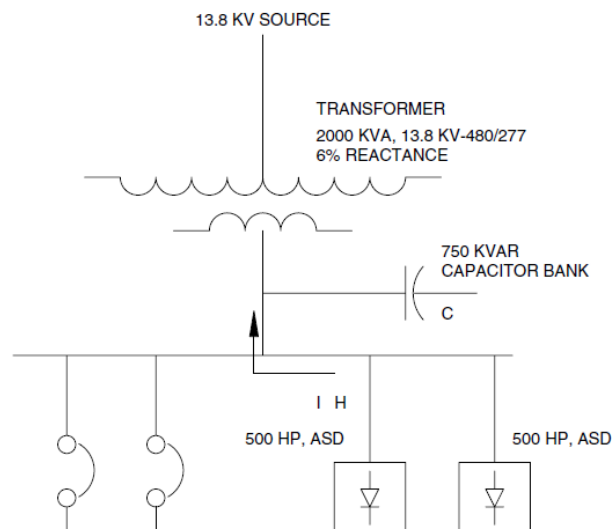

figure.1   **06**

2B. What are the methods of Signal Reference Ground?   **02**

2C. Compare single-point and multipoint grounding   **02**

3A. A single phase fully controlled bridge converter is supplied from 220V, 50 Hz supply. If the firing angle α = 60° compute

  a) Total harmonic distortion of the AC mains current (THD)

  b) Distortion Index (DIN) of the AC mains current

  c) Total demand distortion (TDD) of the AC mains current

  d) Distortion factor

  e) Displacement factor

  f) Power factor

consider continuous load current of 20 A.   **06**

3B. What are the causes & consequences of voltage unbalance   **04**

4A. A single-phase three branch shunt passive filter (PF) (3rd, 5th and high pass filter) is employed to reduce the THD of supply current and to improve the displacement factor to unity, of a single-phase 230V, 50 Hz fed diode bridge converter with an overlap angle of 30° drawing 20A constant dc current as shown in Fig.2. Calculate (a) fundamental active power drawn by the load, (b) fundamental reactive power drawn by the load, (c) elements values of the passive filter , (d) current and VA rating of the passive filter

Figure 2   **06**

4B. Explain any two Common Types of Passive shunt Filters with Impedance- Frequency Plots.   **04**

5A. Using dual PQ theory explain the basic principle & control of series voltage compensation.   **05**

5B. With necessary block diagrams explain the design & working shunt active filter with sinusoidal current control strategy.   **05**

6A. With the help of detailed block diagram explain the configuration and working of the controller of unified power quality conditioner (UPQC).   **08**

6B. What are the limitations of passive filters.   **02**