

**GANPAT UNIVERSITY**  
**M.TECH SEM-II ELECTRICAL ENGINEERING**  
**REGULAR EXAMINATION April - June 2015**  
**3EE206:- POWER QUALITY & ENERGY MANAGEMENT**

Time: 3 Hours

Total Marks:-60

- Instructions:** - 1. Attempt all questions.  
 2. Make suitable assumptions wherever necessary.  
 3. Figures to the right indicate full marks.

**SECTION-I**

- Que-1** [A] List down objectives of energy management and discuss managerial functions involved for the same. [05]  
 [B] To illustrate the calculation of net present value for a project which has following cash flow stream: [05]

| Investment     | Rs. 10,00,000 |
|----------------|---------------|
| Saving in Year | Cash Flow     |
| 1              | 2,00,000      |
| 2              | 2,00,000      |
| 3              | 3,00,000      |
| 4              | 3,00,000      |
| 5              | 3,50,000      |

**OR**

- Que-1** [A] Discuss various steps for the implementation of energy management in an organization. [05]  
 [B] Explain following methods with respect to economic analysis of energy project: [05]  
 (1) Internal Rate of Return (2) Net present value
- Que-2** [A] Discuss energy conservation tips for electrical and thermal utilities. [05]  
 [B] State different factors affecting on the system frequency response characteristic and Explain different system frequency response characteristics. [05]
- OR**
- Que-2** [A] Draw structure of deregulated industry and explain function of different entities. [05]  
 [B] Explain the different instruments required for an Energy audit. [05]
- Que-3** [A] What are the benefits of benchmarking energy consumption? Also discuss project priority guidelines. [05]  
 [B] Discuss ten steps methodology for detailed energy audit. [05]

**SECTION-II**

- Que-4** [A] What do you mean by term "power quality"? Discuss all the power quality issues in brief. [05]  
 [B] Discuss different power frequency disturbances in detail with suitable examples. [05]
- OR**
- Que-4** [A] Explain the cause and effect with respect to power quality point of view? What is an immunity of the equipment? Discuss the treatment criteria for a machine. [05]  
 [B] Write short note on static uninterruptible power source systems with necessary figure. [05]

**Que- 5 [A]** A 2000-kVA, 13.8-kV to 480/277-V transformer with a leakage reactance of 6.0% feeding a bus containing two 500-hp adjustable speed drives. 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. Assume fundamental frequency is 50 Hz. [05]

**[B]** What is harmonic? Explain causes of voltage and current harmonics. [05]

**OR**

**Que- 5 [A]** What are the effect of harmonics on AC motor, capacitor bank and cable in power system? [05]

**[B]** Determine the current rating factor for a 300-kcmil copper conductor required to carry a nonlinear load with the following harmonic frequency content Fundamental = 250 A, 3<sup>rd</sup> harmonic = 25 A, 5<sup>th</sup> harmonic = 60 A, 7<sup>th</sup> harmonic = 45 A, 11<sup>th</sup> harmonic = 20 A. Assume fundamental frequency is 60 Hz. Table.1. Containing values of X and K are available from cable manufacturers. Take 0.0636 is a constant for copper conductors. The magnetic permeability of a nonmagnetic material such as copper is approximately equal to 1.0. The DC resistance of 300-kcmil cable = 0.17 6 per mile. [05]

|  | X     | K      |
|--|-------|--------|
|  | 1.195 | 1.0106 |
|  | 2.069 | 1.089  |
|  | 2.672 | 1.220  |
|  | 3.161 | 1.372  |
|  | 3.963 | 1.664  |

Table:1: Cable Skin Effect Factor

**Que-6 [A]** What is a transient? Discuss the causes of transients in power system. [05]

**[B]** Explain various harmonic filters to mitigate the harmonic in power system. [05]

**END OF PAPER**