

**Elective - II : Power Quality**

P. Pages : 2

Time : Three Hours



**NKT/KS/17/7573**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Define power quality and state its significance. 7
- b) Define the following: 6
- |                   |               |
|-------------------|---------------|
| i) Over voltage   | ii) DC offset |
| iii) Interruption | iv) Noise     |
| v) Interharmonics | vi) Notching  |

**OR**

2. a) Write common problems associated with grounding. 7
- b) What are the good Grounding practices? Explain. 6
3. a) Explain various types of Transient over voltages with suitable example. 6
- b) What are the various voltage regulating devices? Explain any two. 7

**OR**

4. a) What do you mean by voltage unbalance? 5
- b) What is flicker? What are the sources of flicker? Explain any two mitigation techniques for flickers. 8
5. a) What is voltage sag? Derive an expression for voltage sag using voltage divider rule. 4
- b) For 11kV overhead line with 150 mm<sup>2</sup> cross section, the impedance of line is  $(0.117 + j0.315)\Omega/\text{km}$ . The fault level is 750 MVA and source impedance is purely reactive  $Z_s = j0.161\Omega$ . Calculate voltage sag if fault occurs at 10 km from PCC. 4
- c) What are the Mitigation techniques for voltage sag at END USER LEVEL? 6

**OR**

6. a) Explain the concept of Area of vulnerability. 5  
 b) Write a note on: 9  
 i) SMEs  
 ii) UPS  
 iii) Equipment sensitivity

7. a) Distinguish between transients & Harmonics. 6  
 b) Define THD and TDD. 7  
 A PWM based 230 V, 20 A adjustable speed drive has the following parameters.  
 $I_1 = 18A$ ,  $I_3 = 0.08A$ ,  $I_7 = 0.01A$ ,  $I_9 = 0.1A$  &  $I_{11} = 0.001A$   
 Calculate  
 i) RMS value of the current  
 ii) THD and  
 iii) TDD of the supply current

OR

8. a) What is the impact of harmonics on: 6  
 i) Motors ii) Capacitors  
 iii) Telecommunication iv) Energy meters.  
 b) What are the various devices for controlling Harmonics? 7  
 9. a) What are the objectives of power quality monitoring? 7  
 b) What are the power quality monitoring equipment's? Explain any two. 7

OR

10. Write short note on :  
 i) Smart power quality monitoring 4  
 ii) Setting monitoring thresholds 3  
 iii) Locating harmonic sources 3  
 iv) Series and parallel Resonance 4  
 11. a) What is PQSE ? 6  
 b) Explain in details requirements of transducers. 7

OR

12. a) Write a note on on-line and off-line power quality assessment. 7  
 b) Write a short note on IEC flicker meter. 6

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