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**Question Paper Code:U3106**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/ MAY 2025

Professional Elective

Electrical and Electronics Engineering

21UEEV106 - POWER QUALITY

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Explain the purpose of using a flicker meter in power quality monitoring. CO1-U
2. Differentiate Voltage imbalance and Voltage fluctuation. CO1-U
3. Relate the starting of an induction motor affect voltage sag severity. CO1-U
4. Describe the operation of a passive shunt compensator and its role in improving power quality by mitigating voltage fluctuations and harmonic distortions. CO1-U
5. Summarize the purpose of low pass filters in mitigating overvoltage. CO1-U
6. Discuss the ferro resonance and how can it be prevented? CO1-U
7. Analyze the objectives of IEEE and IEC standards. CO1-U
8. Explain why even harmonics are typically absent in power converters. CO1-U
9. Prepare the online power quality monitoring merits. CO1-U
10. Analyze the objectives of power quality monitoring. CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) Apply your understanding of overvoltage phenomena to analyze the impact of a lightning strike on a live conductor of a three-phase overhead power line, focusing on the potential damage to system components. Propose appropriate mitigation techniques, such as surge arresters and grounding, to protect the system from lightning-induced over voltages. CO2-App (16)

Or

- (b) Using the CBEMA and ITI curves, apply your knowledge to determine the acceptable power quality levels for sensitive equipment in a business environment, and recommend strategies to meet these standards. CO2-App (16)
12. (a) Implement a method to estimate voltage sag performance in power systems, taking into account factors such as load, motor starting, and system impedance. Apply this estimation to discuss why setting appropriate performance standards are crucial for ensuring the stability and reliability of the power supply in industrial and commercial settings. CO3-App (16)
- Or
- (b) Demonstrate how voltage sag occurs during the starting of an induction motor, considering factors like inrush current and system impedance. Demonstrate the estimation of the severity of the sag and its impact on the overall performance of the power system. CO3-App (16)
13. (a) Explain the fundamental principles of over voltage protection of load equipment. CO1-U (16)
- Or
- (b) Analyze the working the following device on over voltage. CO1-U (16)
- i) Low pass filters. (5M)
  - ii) Power conditioners. (5M)
  - iii) Surge filters. (6M)
14. (a) Analyze the effect of harmonic distortion on power system performance, focusing on the impact on voltage and current distortion. Evaluate the implications of harmonic distortion on sensitive equipment, and recommend suitable measures to mitigate these effects. CO4-Ana (16)
- Or
- (b) Analyze the effectiveness of passive and active filters for controlling harmonic distortion. Compare their advantages and disadvantages, and propose an appropriate solution for mitigating harmonics in a specific industrial setup. Justify your choice based on the nature of the harmonic sources and the power system's characteristics. CO4-Ana (16)

15. (a) Explain in detail with necessary diagram the working principle and functioning of power quality analyzers. CO1-U (16)

Or

- (b) (i) Explain the steps involved in power quality monitoring. CO1-U (8)  
(ii) Write the information from monitoring site surveys. CO1-U (8)

