Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90997

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

Fifth/Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 3006 — POWER QUALITY

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name two types of waveform distortion.

2. Define notching in load voltage.

3. List any four non-linear loads.

4. Give two differences between three-phase-three-wire and three-phase-four-wire systems.

5. Give the difference between a tuned and de-tuned filter.

6. Write the role of impedance plots for filter banks.

7. What is the ideal structure of a three-phase shunt compensator?

8. Write the role of DSTATCOM in load compensation.

9. Why DVR is called as series compensation device?

10. Draw the block diagram of LPQC.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the different types of power quality disturbances.

Or

(b) Discuss power acceptability curves and their significance in power quality.

12. (a) Discuss the challenges associated with supplying non-linear loads from distorted three-phase sources.

Or

(b) A distribution system is connected with unbalanced loads and non-linear loads which highly affects the current quality of the system. Identify suitable compensation device and explain how the issues related to current quality are mitigated.

13. (a) Compare and contrast series-tuned, double band-pass, and damped filters.

Or

(b) Demonstrate the technique used to mitigate harmonics using active filter.

14. (a) Analyse the instantaneous PQ theory for the generation of reference currents in D-STATCOM for shunt compensation of the non-linear load.

Or

(b) Analyse the output feedback control of D-STATCOM operating in voltage control mode using deadbeat controller.

15. (a) Evaluate the performance of different DVR structures with neat diagrams.

Or

(b) Compare and contrast rectifier-supported and DC capacitor-supported DVR systems.

PART C — ($1 \times 15 = 15$ marks)

16. (a) (i) Analyze the operation of a DVR for a 0.3 p.u. voltage sag lasting 5 cycles. Validate the restoration of voltage and calculate the energy delivered by DVR. (8)

(ii) A system suffers from voltage sag with duration of 100 ms and depth of 40%. Calculate the Voltage Sag Energy Index and propose mitigation using capacitor banks or reclosers. (7)

Or

(b) (i) Analyze a load with 0.65 power factor, determine the required compensation to improve it to 0.95, and calculate the reactive power required. (8)

(ii) Design a passive filter for a three-phase arc furnace that generates 5^{th} and 7^{th} harmonics. Calculate the component values based on load current and frequency. (7)

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