Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40995

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024

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. Write the significance of power quality.

2. List out the causes of voltage imbalance.

3. Differentiate linear and non-linear loads.

4. Write the features of balanced source and balanced load.

5. Justify the reasons for why even harmonics are normally absent in the power converters.

6. Name any four devices for controlling harmonic distortion.

7. Define load compensation.

8. Draw the structure of ideal three-phase shunt compensator.

9. Mention the main functions of DVR.

10. Define voltage restoration.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various power quality problems, issues and solutions in detail.

Or

(b) (i) Discuss about power quality standards.   (7)

(ii) Write short notes on power acceptability curves.   (6)

12. (a) Describe the concepts related with single phase non-sinusoidal source supplying single phase linear and nonlinear loads.

Or

(b) Analyze the power quality in unbalanced three-phase three-wire and three-phase four-wire systems.

13. (a) Name the filters used in harmonic analysis. Explain the operation of active and passive filters.

Or

(b) Explain the procedure to design the second order damped filter and derive the relevant expressions.

14. (a) Explain the concept of symmetrical components theory.

Or

(b) Explain the realization and control of DSTATCOM.

15. (a) Explain the operation of rectifier supported DVR and DC capacitor supported DVR

Or

(b) Explain the principle of operation of Unified Power Quality Conditioner with neat sketches.

PART C — (1 × 15 = 15 marks)

16. (a) A single-phase load having $Z_L = (3.0 + j4.0)$ pu is fed from an AC supply with an input AC voltage of 230 V at 50 Hz and a base impedance of $4.15\,\Omega$. It is to be realized as a unity power factor load on the AC supply system using a shunt connected lossless passive element (L or C) as shown in Figure 16.1. Calculate (i) the value of the compensator element (in Farads or Henrys) and (ii) equivalent resistance (in ohms) of the compensated load. (8+7)
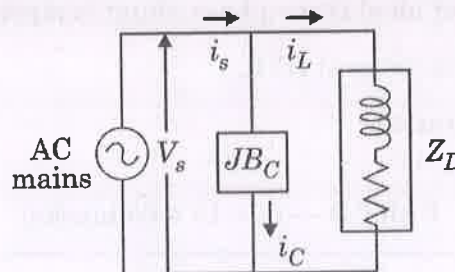

Figure 16.1

Or

(b) Explain the various methods of mitigating power system harmonics.

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