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

Question Paper Code : 52932

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Sixth Semester

Electrical and Electronics Engineering

EE 6002 — POWER SYSTEM TRANSIENTS

(Also Common to PTEE 6002 — Power System Transients for B.E. Part Time – Fifth Semester – Electrical and Electronics Engineering)

(Regulation 2014)

Time : Three hours Maximum : 100 marks

(Codes/Tables/Charts to be permitted, if any may be indicated)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State one cause and effect of transient in a transmission line.

2. Compare the output response of a sine wave in a Lead and Lag network.

3. What is current chopping?

4. How is ferro resonance mitigated?

5. What is charging of thunder clouds?

6. Give the significance of tower footing resistance?

7. Define lumped parameters.

8. What are the principles observed in lattice diagram?

9. Define kilometric fault.

10. What are the applications of EMTP?

PART B — (5 × 13 = 65 marks)

11. (a) Discuss in detail about the adverse effect of transients on power systems.

Or

(b) Explain why transients affect the power quality in a system how protection devices perform for power stability. (7 + 6)

12. (a) Compare (6 + 7)

(i) Resistance switching and

(ii) Capacitive switching.

Or

(b) Explain about multiple restriking transients stating its cause and effects. (6 + 7)

13. (a) What are the theories of charge formation in the clouds? Explain them in detail.

Or

(b) Discuss the interaction between lightning and power system.

14. (a) Explain the transient response of a system with series and shunt distributed line.

Or

(b) Explain the Bewely's lattice diagram.

15. (a) Explain in detail about line dropping and load rejection.

Or

(b) Explain about the voltage transients on closing and reclosing lines.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the double frequency transients with necessary diagrams. (15)

Or

(b) Explain the characteristics of earthing and protection devices to protect grid from Lightning and transients. (15)

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

Question Paper Code : 91467

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Sixth Semester

Electrical and Electronics Engineering

EE 6002 – POWER SYSTEM TRANSIENTS

(Regulations 2013)

(Common to PTEE6002 – Power System Transients for B.E. (Part-Time) – Fifth Semester – Electrical and Electronics Engineering (Regulations 2014))

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the causes for transients ?
2. Draw the TRV waveform across the circuit breaker following the interruption of fault current.
3. What are the causes of switching surges ?
4. What is meant by current chopping ?
5. Mention different theories of charge formation.
6. Write down the significance of tower footing resistance.
7. What are the damages caused by the travelling waves ?
8. Define crest and front of a travelling wave.
9. What is meant by kilometric fault ?
10. What are the effects of load rejection in power systems ?

PART – B **(5×13=65 Marks)**

11. a) Explain the switching transients of RL circuit with sine wave excitation.

(OR)

b) i) Discuss the various types of power system transients. **(8)**

ii) Briefly discuss the various sources of transients on power system. **(5)**

12. a) Describe briefly about characteristic of Ferro resonance.

(OR)

b) What is called capacitive switching ? With necessary sketches, explain capacitive switching with a restrike and multiple restrike.

13. a) i) Explain how lightning interacts with power system. **(7)**

ii) Explain the formation of thunder clouds with the aid of Simpson's theory. **(6)**

(OR)

b) With neat sketch explain the mechanism of lightning strokes.

14. a) Describe the transient response of systems with series and shunt distributed parameters.

(OR)

b) Derive the reflection and refraction coefficients of a travelling wave with diagrams.

15. a) Describe in detail about the causes of over voltages due to various faults occurring in a Power System.

(OR)

b) Examine the computation of Transients in power system using EMTP.

PART – C **(1×15=15 Marks)**

16. a) i) Write a technical note on algorithms used for computation of transient voltages. **(8)**

ii) Discuss the mechanism of lightning discharge. **(7)**

(OR)

b) Explain the steps involved in Bewely's lattice diagram construction with an example. **(15)**

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

Question Paper Code : X 60483

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Sixth Semester
Electrical and Electronics Engineering
EE 2027/EE 604/10133 EEE 16 – POWER SYSTEM TRANSIENTS
(Regulations 2008/2010)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the causes of transients in a power system ?

2. A power transformer draws a heavy magnetizing inrush current. Now this current is suddenly interrupted before it reaches natural zero by means of a circuit breaker. What would happen between the contacts of circuit breaker ? What do you call this phenomenon ?

3. What is resistance switching ?

4. Define current chopping.

5. What are the protective devices used to protect power system equipments against lightning ?

6. What are the properties of a good transmission line ?

7. What is the importance of Bewley's Lattice Diagram ?

8. Draw the equivalent circuit for an infinitesimal element of a line.

9. What is the effect of switching surges on an integrated system ?

10. What are the features of EMTP ?

PART – B **(5×16=80 Marks)**

11. a) Briefly explain the importance of study of transients in planning.

(OR)

b) Explain any one of the source of transients. Also discuss in detail the effects of transients on power systems.

12. a) i) Explain the load switching in both normal and abnormal conditions with neat sketches. **(8)**

ii) Explain current chopping with appropriate equivalent circuit. **(8)**

(OR)

b) What is capacitance switching ? Explain in briefly about capacitance switching with one and multiple restrikes. **(16)**

13. a) With necessary diagrams, describe the interaction between lighting and the power system.

(OR)

b) i) Write short note on tower footing resistance. **(8)**

ii) Briefly explain the mechanism of lightning discharges. **(8)**

14. a) Explain the steps involved in Bewley's Lattice diagram with an example. **(16)**

(OR)

b) Obtain the value of current in a transmission line considering its series and shunt lumped parameters. **(16)**

15. a) With an example explain the switching surges in an integrated power system.

(OR)

b) Explain how faults occurring on power system cause over voltages in transmission lines.

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Reg. No. :

Question Paper Code : X 20465

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Sixth Semester
Electrical and Electronics Engineering
EE 6002 – POWER SYSTEM TRANSIENTS
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the causes of transients ?
2. Draw the double frequency transient with an example.
3. Define current chopping.
4. What is meant by resistance switching ?
5. What are the factors contributing to a good line design ?
6. Mention different theories of charge formation.
7. Why step waves are considered to be dangerous to the apparatus ?
8. Define Standing Wave Ratio.
9. Write an expression for amplitude of the over voltage with circuit diagram during the load rejection.
10. Write a short note on EMTP.

PART – B **(5×13=65 Marks)**

11. a) Examine the sources of transients. Also explain how transients affect the power systems.

(OR)

b) Explain the concept of double frequency transients in power system.

12. a) With neat sketch, explain the capacitance switching with multiple restrikes.

(OR)

b) i) Explain the resistance switching with suitable diagram. **(7)**

ii) Explain the concept of Ferro resonance. **(6)**

13. a) What are the two theories of charge formation in the clouds ? Explain them in detail.

(OR)

b) i) Explain the interaction between lightning and power system. **(7)**

ii) With a neat diagram, explain the protection offered by ground wires. **(6)**

14. a) Derive the reflection and refraction coefficients of a travelling wave.

(OR)

b) With neat sketch, explain Bewley's Lattice diagram.

15. a) Discuss in detail about the kilometric fault with necessary diagrams, expressions and voltage and recovery voltage wave forms.

(OR)

b) Explain the voltage transients on closing and reclosing of lines and switching surges on integrated system.

PART – C **(1×15=15 Marks)**

16. a) With a suitable illustration, discuss computation mechanism and algorithms for analysing the transients in integrated power systems.

(OR)

b) Propose and discuss the design methods, selection procedure and importance of various protective elements should be used in power systems against transients.

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

Question Paper Code : 86589

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Eighth Semester

Electrical and Electronics Engineering

EE 1004 — POWER SYSTEM TRANSIENTS

(Regulations 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is resistance switching?

2. State the importance of transient study in planning.

3. Define the concept of chopping.

4. Differentiate normal and abnormal switching transients.

5. How do earthing screen and ground wires provide protection against direct lightning strokes?

6. What is tower footing resistance?

7. Define attenuation and distortion.

8. What are the effects of load rejection in power systems?

9. Draw the lattice diagram for a single transmission line terminated in an impedance Z.

10. What is meant by EMTP? Write about its importance in transient analysis.

PART B — (5 × 16 = 80 marks)

11. (a) What are the various types of power system transients? With neat diagrams, describe any two types of power system transients in detail. (16)

Or

(b) (i) Discuss about the effect of transients on power systems. (8)

(ii) Describe briefly about double frequency transients. (8)

12. (a) (i) Write short notes on current suppression with neat waveform. (8)

(ii) Explain load switching with their equivalent circuit. (8)

Or

(b) (i) Explain with appropriate waveform the capacitance switching with one and multiple restrikes. (8)

(ii) Write short notes on ferro resonance. (8)

13. (a) (i) Discuss the physical phenomenon of lighting in detail with appropriate diagrams. (8)

(ii) Explain the mechanism of lighting strokes. (8)

Or

(b) (i) Derive the mathematical model for lighting. Write and express various parameters in lighting model. (8)

(ii) Write a detailed technical note on the interaction between lighting and power system mentioning the cause and effects. (8)

14. (a) (i) Discuss about Bewely's Lattice Diagram. (6)

(ii) Explain the phenomena of current interruption in a lumped capacitive circuit and a distributed constant transmission line. (10)

Or

(b) A transmission line of surge impedance 500 Ω is connected through a cable of surge impedance 40 Ω to another line of surge impedance 650 Ω. A travelling wave of 120 u(t) kV travels from 500 Ω line to 5000 Ω line through cable. Calculate.

15. (a) Explain the switching operation involved in transmission line

(i) Line dropping and load rejection of line (8)

(ii) Closing and re closing of lines. (8)

Or

(b) Explain in detail the steps involved in computing transients in power system using EMTP. (16)

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

Question Paper Code : 80481

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth Semester

Electrical and Electronics Engineering

EE 2027/EE 604/10133 EEE 16 — POWER SYSTEM TRANSIENTS

(Regulations 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define transient.
2. Find the inverse Laplace transform of $\frac{1}{s(s+\alpha)}$.
3. What is current suppression?
4. Define ferro resonance.
5. What do you mean by lightning?
6. What are the characteristics of lightning strokes?
7. Brief method of standing waves in analyzing the transients.
8. What is a traveling wave? What is the role of distributed parameters (R, L, C) in it?
9. Mention any four causes of switching surge.
10. Define switching over voltage factor.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Enumerate the types of transients and detail their origin and effects.

Or

(b) The Laplace transform of certain voltage is given by

$$\frac{1.9\times10^{11}}{s^2+2.1\times10^5 s+2\times10^{11}}.$$

Evaluate the time function and sketch its form with reasonable accuracy.

12. (a) With a neat diagram explain the occurrence of transients

(i) Resistance switching (8)

(ii) Capacitance switching. (8)

Or

(b) Explain clearly the phenomenon of current chopping (or current suppression). For the purpose of illustration draw necessary diagrams and waveforms.

13. (a) (i) With neat diagrams, explain the mechanism of cloud formation. (6)

(ii) What is called grounding? Explain the importance and working of Grounding a line structure. (10)

Or

(b) (i) What is meant by lightning discharge? Explain its mechanism in detail. (10)

(ii) What are the characteristics of Lightning strokes? (6)

14. (a) Explain the steps involved in Bewley's Lattice diagram construction with an example. (16)

Or

(b) (i) Discuss transient response of systems with series and shunt lumped parameters and distributed lines. (8)

(ii) Derive the refraction coefficients of a traveling wave. (8)

15. (a) Describe the line dropping and load rejection in detail.

Or

(b) Explain in detail the application of EMTP for transient computation.

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

Question Paper Code : 41026

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

Fifth/Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 3037 — POWER SYSTEM TRANSIENTS

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the cause of transients?
2. Using Laplace transform how do you express voltage across capacitance with initial condition?
3. Distinguish between resistance switching and load switching.
4. Define Ferro resonance.
5. What are the effects of lightning transients?
6. What is the role of ground wires to protect against lightning?
7. What is a travelling wave?
8. What are the advantage of Bewley's lattice diagram.
9. Draw the voltage transient waveform which occur due to closing of lines.
10. Define transient over voltage factor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss about the different sources of transients occuring in power system. (6)

(ii) Explain the importance of study of transients in a system planning. (7)

Or

(b) A series RL circuit consists of a resistor with a resistance of 100 ohms and an inductor with an inductance of 0.2 H. A sinusoidal voltage source with an amplitude of 10 volts and a frequency of 50 Hz is connected to the circuit, At time t=0 , the voltages source is turned on. Calculate the following:

(i) The time constant of the circuit. (4)

(ii) The peak current in the circuit during the transient response. (4)

(iii) The time it takes for the current to reach 90% of its steady–state value. (5)

12. (a) Write short note on the following:

(i) Capacitor switching with multiple restricts. (7)

(ii) Transient due to load switching. (6)

Or

(b) Elaborately discuss about normal and abnormal switching transients. draw relevant diagrams.

13. (a) Explain the theory of cloud formation.

Or

(b) (i) Discuss the characteristics of lightning strokes. (6)

(ii) Evaluate the interaction between lightning and power system. (7)

14. (a) Consider a transmission line with a length of 50 meters and a characteristic impedance of 75 ohms. If the frequency of the input signal is 1 GHZ, calculate:

(i) The wavelength of the signal in the transmission line. (4)

(ii) The natural frequency or resonant frequency of the transmission line. (4)

(iii) Determine whether standing waves will be formed on the transmission line at this frequency. (5)

Or

(b) (i) Derive the reflection and refraction coefficients of a travelling wave. (6)

(ii) Describe the transient response of systems with series and shunt lumped parameters. (7)

15. (a) Write short note on the following:

(i) Short line and kilometric fault. (7)

(ii) Nature of over voltages produced by faults. (6)

Or

(b) Elaborately describe about switching surges on integrated system.

PART C — (1 × 15 = 15 marks)

16. (a) Develop the EMTP representation of any 6 power system parameters and explain each in detail.

Or

(b) In an RLC circuit, a sinusoidal voltage source with a frequency of 100 Hz is suddenly applied across the circuit. The circuit consists of a resistor with a resistance of 50 ohms, an inductor with an inductance of 0.2 H, and a capacitor with a capacitance of 100 μF. Determine the transient response of the circuit at twice the frequency of the applied voltage. Specifically, calculate:

(i) The angular frequency of the applied voltage. (3)

(ii) The resonant frequency of the RLC circuit. (3)

(iii) The expression for the transient response of the current at double the frequency. (3)

(iv) The peak current amplitude at double the frequency. (3)

(v) The time it takes for the current to decay to 10% of its initial of its initial amplitude at double the frequency. (3)