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COLLEGE OF ENGINEERING AND TECHNOLOGY

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QUESTION BANK

BRANCH: EEE **YR/SEM:** III/VI

SUB CODE/NAME: EE6002 – POWER SYSTEM TRANSIENTS

UNIT I

INTRODUCTION AND SURVEY

PART - A

1. What are the effects of transients in power systems? **N/D2017**
2. Write down the importance of transient study in power system planning. **N/D2017**
3. Mention the need for study of transients in a power system. **N/D2016**
4. Classify transients based on its frequency. **N/D2016**
5. What re the causes for transients? **M/J2016,2015, M/J2017**
6. Draw the TRV wave form across the circuit breaker following the interruption of fault current. **M/J2016**
7. Write the basic transforms of RLC circuit transient. **M/J2015**
8. Draw the double frequency transients with an example. **M/J2017 (or)** Draw the double frequency transient's circuit.
9. Write the expression for current in a parallel RL circuit using Laplace transform. **M/J2014**
10. List the various types of power system transients. **M/J2014**
11. What is a transient? **N/D2014, M/J2013**
12. Write the mathematical expression for transient due to RLC circuits? **N/D2014**
13. Define power system transients?
14. Mention the source of power system transients.
15. What is meant by ferro resonance?
16. What is meant by arcing ground?
17. What is meant by lightning?
18. What is insulation failure?
19. What is meant by subsidence transients?
20. What is meant by lightning?
21. What is current chopping?

PART - B

RL CIRCUIT WITH SINE WAVE EXCITATION

1. Explain the switching transients of RL circuit with sine wave excitation. **(16) N/D2017 (or)** Derive the expression for RL circuit transient with sine wave excitation. **(16)M/J2017, (8)M/J2014,(16) M/J2013**

TYPES OF POWER SYSTEM TRANSIENTS

2. Discuss the various types of power system transients. **(8) N/D2017,(16)N/D2014 (or)** What are the various types of power system transients? With neat diagram, describe any two types of power system transients in detail. **(16)M/J2015**

DOUBLE FREQUENCY TRANSIENTS

3. Briefly discuss about double frequency transients. **(8) N/D2017,(8)N/D2014 (or)** Explain the concept of double frequency in power system. **(16) N/D2016 (or)** Explain the double frequency transient in a power system with a circuit diagrams, waveforms and expressions. **(16)M/J2016 (or)** With suitable example explain double frequency transients. **(16)M/J2017, (8)M/J2014**

SOURCE OF TRANSIENTS

4. Examine the source of transients? Also explain how transients affect the power systems. **(16) N/D2016 (or)** Discuss briefly the various causes for transients. **(8)M/J2014**
5. Briefly explain the importance of study of transients in planning. **(16)M/J2016, (8)M/J2015,(8)N/D2014**

EFFECTS OF TRANSIENTS

6. Discuss about the effects of transients on power systems. **(8)M/J2015, (8)M/J2014**
7. Using Laplace transform derive the expression for transients due to RLC elements. **(16) M/J2013**

PART - C

1. Explain the double frequency transient in a power system with a circuit diagrams, waveforms and expressions.
2. Discuss briefly the various causes for transients.

UNIT II

SWITCHING TRANSIENTS

PART - A

1. What is current chopping in A.C system? **N/D2017 (or)** Define current chopping. **N/D2016, M/J2016, M/J2014**
2. Distinguish between lightning surges and switching surges. **N/D2017**
3. What is meant by abnormal switching transients? **M/J2017**
4. Sketch the restrike waveform of the capacitance switching. **M/J2017**
5. What is meant by resistance switching? **N/D2016**
6. Draw the resistance switching circuit. **M/J2016**
7. What is current suppression? **M/J2015**
8. Define ferro resonance. **M/J2015, M/J2014, N/D2014**
9. Why multiple restrike occur due to capacitance switching? **N/D2014**
10. Give a power system example for the occurrence of Ferro resonance. **M/J2013**
11. What does the phenomenon of current suppression lead to? **M/J2013**
12. What is switching transients?

13. What is load switching?
14. Define capacitance switching?
15. Define Ferro resonance condition.
16. What is the need of resistance switching?
17. Why the air blast circuit breakers are more sensitive to restriking voltage transient?

PART – B

CAPACITANCE SWITCHING

1. With neat sketch explain the capacitance switching with multiple restrikes. **(16) N/D2017, (8)M/J2014 (or)** Explain capacitance switching with circuit and waveforms showing the effect of source regulation, one and multiple restrikes. (**16)M/J2016, (16)M/J2015, (16)M/J2017,(8) M/J2013**

LOAD SWITCHING

2. With neat diagram explain the concept of load switching. **(8) N/D2017, (4)M/J2014** Explain load switching with circuit and waveforms. **(8)M/J2016,(16)N/D2014**
3. Explain the load switching in both normal and abnormal conditions with neat sketches. **(8)M/J2015 (or)** Briefly describe the normal and abnormal switching transients. **(8)M/J2014,(8)N/D2014**

FERRO RESONANCE

4. With suitable example explain the concept of Ferro resonance. **(8) N/D2017, (8) N/D2016 (or)** Explain in detail 'ferro resonance' with circuit and waveform diagrams. **(8)M/J2016 (or)** Describe briefly about characteristic of Ferro resonance. **(16)M/J2017**

CURRENT CHOPPING

5. Write short note on current chopping. **(8) N/D2016**
6. What is meant by current suppression? Explain the concept in an unloaded transformer with relevant wave forms. **(16) N/D2016 (or)** Explain the phenomenon of current suppression with an example. **(8)M/J2014**
7. Explain current chopping with appropriate equivalent circuit. **(8)M/J2015, (16)M/J2013**

RESISTANCE SWITCHING

8. Write short note on Resistance switching. **(4)M/J2014 (or)** Write a short note on resistance switching and develop the equivalent circuit. **(8)N/D2014,(8) M/J2013**

PART - C

1. Explain capacitance switching with circuit and waveforms showing the effect of source regulation, one and multiple restrikes.
2. Explain current chopping with appropriate equivalent circuit.

UNIT – III
LIGHTNING TRANSIENTS
PART - A

1. What are the factors contributing to good line design? **N/D2017, M/J2014**
2. List out the important characteristics of lightning. **N/D2017**
3. Define isokeraunic level or thunderstorm days? **N/D2016**
4. What is ground wire? **N/D2016**
5. Give the measurement details of induced voltage on overhead lines due to lightning. **M/J2016**
6. What is the significance of tower footing resistance? **M/J2016, M/J2017**

7. What is called charge formation? **M/J2017**
8. What are the types of protection afforded by ground wires? **M/J2015**
9. Define tower footing resistance. **M/J2015, N/D2014**
10. Draw the model for lightning stroke. **M/J2014**
11. What is the rate of charging of thunder clouds? **N/D2014**
12. What are the factors in which the tower footing resistance depend on? **M/J2013**
13. Define over voltage protection factor?
14. Define lightning?
15. What are the different types of strokes?
16. What are the causes of over voltage in power system?
17. What is back flashover?
18. Define Basic Impulse level.
19. Mention the different theories of charge formation.
20. What is the necessity of insulation coordination?

PART – B

LIGHTNING PHENOMENON

1. Discuss the mechanism of lightning discharge. **(8)N/D2017, (8)N/D2016, (8)M/J2014, (8)M/J2013**
2. Explain the formation of thunder clouds with the aid of various theories. **(8) N/D2017**
3. Sketch the characteristics of lightning strokes and also discuss the parameters of lightning flash. **(16) N/D2016 (or)** Discuss in detail about the lightning flash parameters. **(8)M/J2016, (8)M/J2015 (or)** Explain the characteristics of lightning strokes. **(8)N/D2014**
4. Explain in detail how the charges are formed in the clouds. **(8)M/J2015 (or)** What are the two theories of charge formation in the clouds. Explain them in detail. **(16)M/J2017, (8)M/J2014,(8)N/D2014**
5. Difference between direct and indirect lightning strokes. **(8)M/J2016**

PROTECTION AGAINST LIGHTNING TRANSIENTS

6. Explain the lightning protection schemes for transmission lines. **(16) N/D2017 (or)** How the ground wires protect the transmission line from lightning transients? Explain. **(8)M/J2016, (8)M/J2017**

TOWER FOOTING RESISTENCE

7. Explain the concept of tower footing resistance. **(8) N/D2016, (8)M/J2013**

FACTORS CONTRIBUTING TO GOOD LINE DESIGN

8. What are the factors that contributing to good line design? Discuss in detail. **(8)M/J2016,(8)N/D2014**

MATHEMATICAL MODEL FOR LIGHTNING

9. Derive the mathematical model for lightning. **(8)M/J2015,(8)N/D2014**

INTERACTION BETWEEN LIGHTNING AND POWER SYSTEM

10. Describe the interaction between lightning and power system. **(8)M/J2015, (8)M/J2017(or)** With necessary diagrams and equivalent circuit, discuss the interaction between lightning and power system. **(16)M/J2014, (16)M/J2013**

PART - C

1. Discuss the mechanism of lightning discharge.
2. Explain the lightning protection schemes for transmission lines.
3. Explain in detail how the charges are formed in the clouds.

UNIT-4

TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS

PART-A

1. Define standing wave ratio. **N/D2017**
2. Define reflection and refraction coefficients. **N/D2017**
3. What are standing waves? **M/J2017, N/D2014**
4. What is attenuation? How they are classified? **M/J2017**
5. What are the damages caused by the travelling waves? **N/D2016**
6. Define crest and front of a travelling wave. **N/D2016**
7. Draw the neat sketch of Bewely's lattice diagram. **M/J2016**
8. Draw the diagram of meeting of two positive current waves in opposite directions. **M/J2016**
9. What is the importance of Bewely's lattice diagram? **M/J2015**
10. Draw the equivalent circuit for an infinitesimal element of a line. **M/J2015**
11. Write the travelling wave equation and define the terms. **M/J2014**
12. Draw the lattice diagram of a single transmission line terminated by impedance. **M/J2014**
13. What is Bewely's lattice diagram? **N/D2014**
14. What do you infer from a lattice diagram? **M/J2013**
15. What is the application of Bewely's lattice diagram?
16. What is surge impedance of line and why is it also called the natural impedance?
17. What do you mean by travelling wave?
18. Define Tail and Polarity of a wave.
19. What is the effect of shunt capacitance at the terminal of a transmission lines?
20. How are the transmission lines classified?

PART-B

BEWELY'S LATTICE DIAGRAM

1. Explore the steps involved in Bewely's lattice diagram construction with an example. **(16) N/D2017, (16)M/J2017, (16) N/D2016, (16)M/J2015**

TRAVELLING WAVES ON TRANSMISSION LINES

2. Discuss transient response of systems with series and shunt lumped parameters and distributed lines. **(16) N/D2016, (16)M/J2016, (8)M/J2015, (16)M/J2013 (or)** Derive the transient response of systems with series and shunt lumped parameters.**(16)M/J2014, (16)N/D2014**
3. With neat diagram discuss the behaviour of a travelling wave when it reaches the end of
   i) Open circuited transmission line. **(8) N/D2017, (8)M/J2017**
   ii) Short circuited transmission line. **(8) N/D2017, (8)M/J2017**

REFLECTION AND REFRACTION OF TRAVELLING WAVE

4. Derive the reflection and refraction coefficients of a travelling wave with diagrams. **(16)M/J2016, (16)N/D2014 (or)** Derive the refraction coefficient of a travelling lines. **(8)M/J2015 (or)** Discuss the reflection and refraction coefficients of a travelling wave **(16)M/J2014**
   i) at a junction between two lines

ii) encountering a line bifurcation
iii) from a short circuit.

5. Explain about travelling wave concept for step response?
6. Derive the standing wave equation?
7. Explain about attenuation and distortion of travelling wave?

PART - C

1. Explore the steps involved in Bewely's lattice diagram construction with an example.
2. Discuss transient response of systems with series and shunt lumped parameters and distributed lines.

UNIT-V

TRANSIENTS IN INTEGRATED POWER SYSTEM

PART-A

1. How will you calculate the probability of strikes for an overhead line? **N/D2017**
2. Define short line or kilometric fault. **N/D2017, N/D2016, M/J2015, M/J2017, M/J2014, N/D2014**
3. What are the effects of load rejection in power systems? **M/J2017**
4. Write the network calculation to model a transmission network of EMTP. **N/D2016**
5. Write an expression for amplitude of the over voltage with circuit diagram during the load rejection. **M/J2016**
6. Write a short note on EMTP. **M/J2016**
7. Distinguish between line dropping and load rejection. **M/J2015**
8. Which software do you suggest to solve electrical transient problems? **M/J2014**
9. Mention the features of EMTP. **N/D2014,M/J2013**
10. What is the effect of switching surges on an integrated system? **M/J2013**
11. Define reflection coefficient.
12. Define transmission coefficient.
13. What are the effects of load rejection in power system?
14. What are effects of transients when a switch is closed?
15. Write the network equation to model a transmission network for EMTP calculation.

PART-B

EMTP FOR TRANSIENT COMPUTATION

1. Explain the application of EMTP for transient computation. **(8) N/D2017 (or)** Examine the computation of Transients in power system using EMTP. **(16) N/D2016, (16)M/J2015**

SWITCHING SURGES ON INTEGRATED POWER SYSTEM

2. Evaluate the reflection and transmission coefficient in an integrated power system. **(8) N/D2017**

OVER VOLTAGE INDUCED BY FAULTS

3. Describe the causes of over voltage induced by various faults in a power system. **(8) N/D2017, (8)M/J2014, (8)M/J2013 (or)** Describe in detail about the causes of over voltage due to various faults occurring in a power system. **(16) N/D2016, (10)N/D2014**

VOLTAGE TRANSIENTS ON CLOSING AND RECLOSING TIMES

4. Explain the causes of transients on closing and reclosing of transmission lines. **(8) N/D2017, (8)M/J2017**
5. Explain the voltage transients on closing and reclosing of lines and switching surges on integrated system. **(16) M/J2016 (or)** Derive the voltage transients on reclosing lines. **(8)M/J2015 (or)** Explain in detail about the switching surges on integrated system. **(16)M/J2017, (16)M/J2014, (6)N/D2014**
6. Describe how the voltage is distributed in a power system. **(8)M/J2015, (10)N/D2014**

LINE DROPPING AND LOAD REJECTION

7. Explain about line dropping and load rejection in integrated power system. **(8)M/J2017, (6)N/D2014,(16)M/J2013**

SHORT LINE AND KILOMETRIC FAULT

8. Discuss in detail about the kilometric fault with necessary diagrams, expressions and voltage and recovery voltage waveforms. **(16) M/J2016, (8)M/J2013**
9. Describe briefly about short line fault. **(8)M/J2014**

PART - C

1. Explain the application of EMTP for transient computation.
2. Explain the voltage transients on closing and reclosing of lines
3. Explain switching surges on integrated system.

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