

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

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ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK



1905707 – Power Systems Transients

VII Semester

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EEE-Question Bank: 1905707 – Power Systems Transients, VII Semester, Academic Year: 2025-26 (Odd)				
Q.No	Questions	BT Level	Competence	Course Outcome
UNIT I -Introduction and Survey				
Part-A				
1	Define Power system transient.	BTL 1	Remember	CO1
2	Draw the double frequency transient with an example.	BTL 1	Remember	CO1
3	List the causes of transients on the power system.	BTL 1	Remember	CO1
4	Discuss about the voltage surge?	BTL 2	Understand	CO1
5	Name any two effects of transients in the power system.	BTL 1	Remember	CO1
6	Identify the effects of lightning?	BTL 1	Remember	CO1
7	Classify the types of power system transient?	BTL 1	Remember	CO1
8	Give example for internal sources for transients	BTL 2	Understand	CO1
9	Give examples for external sources for transients.	BTL 2	Understand	CO1
10	Give the relation between time constant of parallel and series circuit.	BTL 2	Understand	CO1
11	Highlight the effects of lightning transients?	BTL 2	Understand	CO1
12	Write down the importance of transient study in power system planning	BTL 3	Apply	CO1
13	Classify transients based on its frequency.	BTL 2	Understand	CO1
14	Outline the concept of the word “surge”?	BTL 3	Apply	CO1
15	Express the lightning and switching impulse standard	BTL 3	Apply	CO1
16	Outline the concept you understand from the word “transient”?	BTL 5	Evaluate	CO1
17	Draw the transient response waves for RL and RC.	BTL 4	Analyze	CO1
18	What are the effects of Transients in power systems	BTL 4	Analyze	CO1
19	Distinguish between critically damped, underdamped and overdamped in a case of RLC Series circuit.	BTL 4	Analyze	CO1
20	Define transient due to electro mechanical phenomena.	BTL 3	Apply	CO1
21	How do transients cause intermittent interruptions?	BTL 4	Analyze	CO1
22	Give single frequency recovery voltage transients.	BTL 4	Analyze	CO1
23	How load rejection overvoltage occurs?	BTL 4	Analyze	CO1
24	Enumerate the influence of a transient on electronic equipment.	BTL 6	Create	CO1
Part-B				
1	i)Analyze the sources and effects of transients on power systems? (7) ii)Categorize the internal causes for transients. (6)	BTL 1	Remember	CO1
2	Discuss the significance of transient studies in power system planning. (13)	BTL 1	Remember	CO1
3	Briefly explain about double frequency transients. (13)	BTL 6	Create	CO1
4	Discuss the various types of power system transients. (13)	BTL 2	Understand	CO1
5	Define Transient. Describing in detail about it is importance (13)	BTL 2	Understand	CO1
6	Explore the classifications of power system transients? (13)	BTL 5	Evaluate	CO1
7	Explain briefly about various source of Transients on power systems. (13)	BTL 3	Apply	CO1
8	Demonstrate with neat diagrams about the types of power system transients. (13)	BTL 2	Understand	CO1
9	Examine the sources of transients? Also explain how transients affect the power systems. (13)	BTL 4	Analyze	CO1
10	Write a short note on voltage surge. (13)	BTL 1	Remember	CO1
11	Briefly explain the importance of study of transients in planning. (13)	BTL 4	Analyze	CO1
12	Briefly explain about lightning transients. (13)	BTL 4	Analyze	CO1
13	Explain the switching transient of RL circuit with sine wave excitation. (13)	BTL 3	Apply	CO1
14	Explain the switching transient of RC circuit with sine wave excitation. (13)	BTL 3	Apply	CO1
15	Describe the detail the characteristics of power system transients. (13)	BTL 3	Apply	CO1

16	Explain the operating characteristics of double frequency transients with examples. (13)	BTL 3	Apply	CO1
17	Explain in detail the basic transforms of the RLC parallel circuit transients. (13)	BTL 4	Analyze	CO1
Part-C				
1	Briefly explain the importance of study of transients in power system planning for the future expansion. (15)	BTL 5	Evaluate	CO1
2	Explain the various mitigation methods depend mostly on the cause of the overvoltage. (15)	BTL 6	Create	CO1
3	Briefly discuss double frequency transients and draw waveforms neatly. (15)	BTL 6	Create	CO1
4	Obtain the transient current component $i(t)$ for RLC circuit with sine wave excitation. (15)	BTL 5	Evaluate	CO1
5	Discuss the various types of power system transients. (15)	BTL 6	Create	CO1
Unit II - Switching Transients				
PART –A				
1	Distinguish between lightning surges and switching surges	BTL 1	Remember	CO2
2	Draw the equivalent circuit of resistance switching	BTL 1	Remember	CO2
3	Define load switching	BTL 2	Understand	CO2
4	Discuss about abnormal switching transients?	BTL 2	Understand	CO2
5	Discuss about resistance switching?	BTL 1	Remember	CO2
6	Recognize temporary over voltages?	BTL 1	Remember	CO2
7	Outline the need for resistance switching?	BTL 2	Understand	CO2
8	Explore the concept of abnormal switching transients	BTL 6	Create	CO2
9	Demonstrate how load switching leads to transient	BTL 4	Analyze	CO2
10	Define switching transients	BTL 1	Remember	CO2
11	Differentiate normal and abnormal switching transients	BTL 5	Evaluate	CO2
12	Discuss the objectives of capacitance switching and associated capacitor switching transients.	BTL 3	Apply	CO2
13	Discuss the following TRV, RRRV?	BTL 2	Understand	CO2
14	Sketch the voltage and current waveforms during capacitance switching with the restriking at peak voltage	BTL 3	Apply	CO2
15	Define switching surges.	BTL 3	Apply	CO2
16	Interpret reason for occurrence of restriking when Circuit breaker contacts open during the fault.	BTL 3	Apply	CO2
17	Show the objectives of switching capacitor banks.	BTL 4	Analyze	CO2
18	Interpret the effect of atmospheric conditions on severity of switching transients in power systems.	BTL 5	Evaluate	CO2
19	Discuss about current chopping in AC system	BTL 2	Understand	CO2
20	Explain how the ferro resonance causes overvoltage.	BTL 3	Apply	CO2
21	Describe the term reignition.	BTL 4	Analyze	CO2
22	Explain the effect of unloaded high voltage transmission lines.	BTL 5	Evaluate	CO2
23	Discuss the quasi-periodic mode of ferro resonance.	BTL 2	Understand	CO2
24	Define Ferro resonance?	BTL 1	Remember	CO2
Part-B				
1	Examine the phenomenon in switching transient. (13)	BTL 3	Apply	CO2
2	i) A neat diagram explains the concept of load switching. (7) ii) With suitable examples explain the concept of ferro resonance. (6)	BTL 1	Remember	CO2
3	Explain load switching with an equivalent circuit. (13)	BTL 1	Remember	CO2
4	Differentiate between normal and abnormal switching transients in load switching. (13)	BTL 3	Apply	CO2
5	Discuss the control of transients over voltages in the power system. (13)	BTL 4	Analyze	CO2

6	i) Analyze in detail the resistance switching with a suitable diagram.(7) ii) With neat sketch explain the concept of Current Chopping. (6)	BTL 5	Evaluate	CO2
7	Discuss the switching in both normal and abnormal conditions with neat sketches. (13)	BTL 1	Remember	CO2
8	Discuss about current suppression? (13)	BTL 6	Create	CO2
9	What is meant by current suppression? Explain the transients due to switching of an unloaded transformer with relevant waveforms. (13)	BTL 2	Understand	CO2
10	Write short note on (i) Ferro resonance (ii) current Chopping. (7+6)	BTL 1	Remember	CO2
11	Explain the control of switching surges and highlight how switching surges affects capacitive Current. (13)	BTL 2	Understand	CO2
12	Discuss (i) Current Chopping (ii) Resistance Switching. (13) (7+6)	BTL 4	Analyze	CO2
13	With neat sketch explain the capacitance switching with multiple restrikes. (13)	BTL 4	Analyze	CO2
14	Explain in detail about the simulation of switching surges and Ferro resonance effect	BTL2	Understand	CO2
15	Explain briefly about overvoltage due to switching transients. (13)	BTL 4	Analyze	CO2
16	Explain the phenomena of ferro resonance in power system networks with suitable illustration. (13)	BTL 4	Analyze	CO2
17	Explain the two categories of switching operations	BTL2	Understand	CO2
Part-C				
1	Explain in detail about (i)Resistance switching and interruption of resistance current with equivalent circuit. (10) ii) Load switching with their equivalent circuits. (5)	BTL 5	Evaluate	CO2
2	Derive an expression for the transient current in RLC. (15)	BTL 6	Create	CO2
3	Explain with appropriate waveform and equivalent circuit i) Current suppression. (4) ii) Current chopping. (4) iii) capacitance switching. (4) iv) Ferro resonance. (3)	BTL 5	Evaluate	CO2
4	Draw an equivalent circuit for the resistance switching and explain the equivalent circuit for interrupting resistor current. (15)	BTL 6	Create	CO2
5	What is known as load switching? Derive its equivalent circuit. (15)	BTL 6	Create	CO2
Unit III - Lightning Transients				
PART – A				
1	List out the important characteristics of the lightning stroke	BTL1	Remember	CO3
2	Discuss the significance of tower footing resistance?	BTL 2	Understand	CO3
3	Outline the concept of charge formation?	BTL 3	Apply	CO3
4	Mention different theories of charge formation.	BTL 2	Understand	CO3
5.	List out any two causes of over voltages.	BTL 1	Remember	CO3
6.	Interpret the concept of lightning and also highlight the factors which influence the lightning induced voltages on transmission lines?	BTL 3	Apply	CO3
7	List out the types of lightning.	BTL 1	Remember	CO3
8	Discuss about insulation failure.	BTL 2	Understand	CO3
9	Summarize the ways for over voltage protection.	BTL 2	Understand	CO3
10	Explain direct lightning strokes.	BTL 1	Remember	CO3
11.	What are the factors contributing to good transmission line	BTL 3	Apply	CO3
12	Explore the necessity of insulation coordination.	BTL 5	Evaluate	CO3
13	Examine the basic steps involved in insulation co- ordination.	BTL 4	Analyze	CO3
14	Explain counterpoise wires.	BTL 4	Analyze	CO3
15	Explain the various regions of the cloud.	BTL 4	Analyze	CO3
16	Explain protective angle.	BTL 4	Analyze	CO3
17	Explore the concept of back flashover.	BTL 6	Create	CO3

18	Define isokeraunic level (or) thunderstorm days.	BTL 5	Evaluate	CO3
19	Show the objectives of ground wire.	BTL 3	Apply	CO3
20	Define basic impulse level.	BTL 1	Remember	CO3
21	Explain how protection of lines is achieved due to lightning.	BTL 6	Create	CO3
22	Discuss the effects and nature of danger made due to lightning strokes.	BTL 5	Evaluate	CO3
23	Explain the Wilson theory of lightning.	BTL 3	Apply	CO3
24	Give the effects of shield wire on the headline.	BTL 1	Remember	CO3
Part-B				
1	i) Sketch the characteristics of lightning stroke. (6) ii) Explain the formation of thunder clouds with the aid of various theories. (7)	BTL 3	Apply	CO3
2	Analyze the factors that contribute to good line design. (13)	BTL 4	Analyze	CO3
3	Evaluate the interaction between lightning and the power system. (13)	BTL 6	Create	CO3
4	Derive an expression for the mathematical model for lightning. (13)	BTL 5	Evaluate	CO3
5	Explain the mechanism of lightning discharge and concept of footing resistance. (13)	BTL 2	Understand	CO3
6	i) What are the factors that contribute to good line design? Discuss in detail. (6) ii) How the ground wires protect the transmission line from lightning transients? Explain. (7)	BTL 3	Apply	CO3
7	What are the two theories of charge formation in the clouds that explain them in detail? (13)	BTL 1	Remember	CO3
8	Explain about grounding a line structure and protection offered by ground wires. (13)	BTL 2	Understand	CO3
9	Explain the lightning protection schemes for transmission lines. (13)	BTL 2	Understand	CO3
10	Investigate the mechanism of the lightning phenomenon and also interpret the stepped leader. (13)	BTL 1	Remember	CO3
11	With neat sketches, explain the two different theories of charge formation in the clouds. (13)	BTL 3	Apply	CO3
12	Explain the mechanisms by which lightning strokes develop and induce over voltages on overhead power lines. (13)	BTL 2	Understand	CO3
13	With a neat diagram, explain the protection offered by ground wires. (13)	BTL 2	Understand	CO3
14	i) Discuss in detail about the lightning flash parameters. (6) ii) Differentiate between direct and indirect lightning strokes. (7)	BTL 2	Understand	CO3
15	Explain the characteristics of tower impedance and footing impedance. (13)	BTL 3	Apply	CO3
16	Explain the effects of shield wire on over headline with neat schematic. (13)	BTL 4	Analyze	CO3
17	Evaluate the various effects and nature of danger due to lightning discharge. (13)	BTL 6	Create	CO3
Part-C				
1	Explain the mathematical models for lightning discharges and explain them. (15)	BTL 5	Evaluate	CO3
2	With a neat diagram explain the protection offered by ground wires. (15)	BTL 6	Create	CO3
3	Explain the counter poise method of protection. (15)	BTL 5	Evaluate	CO3
4	Propose and discuss the design methods, selection procedure and importance of various protective elements should be used in power systems against transients. (15)	BTL 6	Create	CO3
5	Summarize the mathematical model for lightning. (15)	BTL 6	Create	CO3
Unit IV - Travelling Waves on Transmission Line Computation of Transients				
Part – A				
1	Give the specifications of a travelling wave?	BTL 2	Understand	CO4

2.	Express the equations for reflection coefficient and refraction coefficient.	BTL 2	Understand	CO4
3.	Comment on “Same velocity of propagation over all overhead line.	BTL 6	Create	CO4
4	Discuss about lumped parameters?	BTL 2	Understand	CO4
5.	Draw a neat sketch of standing waves.	BTL 1	Remember	CO4
6.	Outline the concept you understand from the word “travelling waves”?	BTL 1	Remember	CO4
7	List out the damages caused by the travelling waves.	BTL 1	Remember	CO4
8.	Define surge impedance of a line and comment on the reason for naming it as natural impedance.	BTL 6	Create	CO4
9	Give the application of bewley’s lattice diagram.	BTL 3	Apply	CO4
10	Define crest and front of a travelling wave.	BTL 1	Remember	CO4
11	Define refraction coefficients.	BTL 1	Remember	CO4
12.	Justify “Step waves are considered to be dangerous to the apparatus”.	BTL 5	Evaluate	CO4
13.	Discuss the effect of shunt capacitance at the terminal of transmission lines.	BTL 4	Analyze	CO4
14.	Define attenuation? How they are caused.	BTL 3	Apply	CO4
15.	Outline the concept of distortion?	BTL 3	Apply	CO4
16.	Write an expression for amplitude of the overvoltage with circuit diagram during the load rejection.	BTL 1	Remember	CO4
17	Draw the neat sketch of Bewley’s lattice diagram.	BTL 1	Remember	CO4
18	Define crest and front of a travelling wave.	BTL 4	Analyze	CO4
19	Define Standing wave ratio.	BTL 4	Analyze	CO4
20	Differentiate travelling waves and standing waves.	BTL 5	Evaluate	CO4
21	What are the characteristics obtained in lossless transmission lines?	BTL 1	Remember	CO4
22	Explain the need for a lattice diagram.	BTL 4	Analyze	CO4
23	Give the transient response of systems with series and shunt lumped parameters.	BTL 4	Analyze	CO4
24	Explain the voltage reflection coefficient.	BTL 5	Evaluate	CO4
Part-B				
1	Explore the steps involved in Bewely’s lattice diagram construction with an example. (13)	BTL 6	Create	CO4
2	Evaluate the value of current in a transmission line considering its series and shunt lumped parameters. (13)	BTL 1	Remember	CO4
3	Draw the step response of a travelling wave. Explain it by using Bewely’s lattice diagram. (13)	BTL 1	Remember	CO4
4	Discuss elaborately on reflection of travelling waves. (13)	BTL 1	Remember	CO4
5	Examine multi-velocity waves of travelling waves in transmission lines. (13)	BTL 4	Analyze	CO4
6	Explain a multi-conductor system of travelling waves in transmission lines. (13)	BTL 3	Apply	CO4
7	Develop a wave equation of travelling waves in transmission lines. (13)	BTL 5	Evaluate	CO4
8	Describe the transient response of systems with series and shunt distributed parameters. (13)	BTL 2	Understand	CO4
9	Examine the behavior of travelling waves at open circuited transmission lines. (13)	BTL 4	Analyze	CO4
10	Describe briefly about standing waves and Standing Wave Ratio (SWR) and natural frequency. (13)	BTL 2	Understand	CO4
11	Derive the reflection and refraction coefficient of a travelling wave with diagrams. (13)	BTL 6	Create	CO4
12	Analyze the phenomenon of current interruption in a lumped capacitive circuit and a distributed constant transmission line. (13)	BTL 4	Analyze	CO4

13	A long transmission line is energized by a unit step voltage 1.0 V at the sending end and is open Circuited at the receiving end. Develop the Bewley's Lattice diagram and obtain the value of the voltage at the receiving end after a long time. Take the attenuation factor $\alpha = 0.8$. (13)	BTL 6	Create	CO4
14	Explain the mathematical expression of voltage and current travelling wave. (13)	BTL 4	Analyze	CO4
15	Evaluate the transient response of systems with series and shunt lumped parameters. (13)	BTL 2	Understand	CO4
16	Discuss elaborately on refraction of travelling waves. (13)	BTL 6	Create	CO4
17	Analyze the phenomenon of current interruption in a lumped capacitive circuit and a distributed constant transmission line. (13)	BTL 4	Analyze	CO4
Part-C				
1	a) With neat diagrams discuss the behavior of a travelling wave when it reaches the end of i) open circuited transmission line ii) Short circuited transmission line. (15)	BTL 5	Evaluate	CO4
2	Explain the behavior of travelling waves at short circuited lines. (15)	BTL 5	Evaluate	CO4
3	Explore the steps involved in Bewely's lattice diagram construction with an example. (15)	BTL 6	Create	CO4
4	Discuss and drive transient response of systems with series and shunt lumped parameters and Distributed lines. (15)	BTL 5	Evaluate	CO4
5	Obtain the value of current in a transmission line considering its series and shunt lumped. (15)	BTL 6	Create	CO4
Unit V - Transients in Integrated Power System				
PART – A				
1	Define short line or kilometric fault.	BTL 1	Remember	CO5
2	Sketch the Norton's equivalent circuit to model a capacitor in a network for EMTP calculation.	BTL 3	Apply	CO5
3	How will you calculate the probability of strikes for an overhead line?	BTL 1	Remember	CO5
4	Distinguish between closing and reclosing lines on voltage transients.	BTL 2	Understand	CO5
5	Outline the causes of over voltage.	BTL 1	Remember	CO5
6	Discuss about switching surges.	BTL 2	Understand	CO5
7	Draw the EMTP model of the transmission line.	BTL 1	Remember	CO5
8	Draw the EMTP model of resistor.	BTL 1	Remember	CO5
9	Outline the concept behind EMTP.	BTL 1	Remember	CO5
10	List out the effects of load rejection in power systems?	BTL 1	Remember	CO5
11	Write the network equation to model a transmission network for EMTP calculation	BTL 3	Apply	CO5
12	Discuss the effects of transients when a switch is closed.	BTL 4	Analyze	CO5
13	What are the effects of load rejection in the power system?	BTL 4	Analyze	CO5
14	Comment on "Digital computation is required to analyze Power system transients".	BTL 6	Create	CO5
15	Identify any two advantages of EMTP software packages.	BTL 4	Analyze	CO5
16	Write an expression for amplitude of the overvoltage with circuit diagram during the load rejection.	BTL 3	Apply	CO5
17	Draw the EMTP model of inductor and capacitor.	BTL 1	Remember	CO5
18	Give the applications of EMTP.	BTL 6	Create	CO5
19	Discuss about distribution of voltage in the power system.	BTL 6	Create	CO5
20	Write a short note on EMTP.	BTL 3	Apply	CO5
21	What is consistent between all switching surge events?	BTL 1	Remember	CO5
22	Summarize the kilometric faults on transmission lines.	BTL 6	Create	CO5
23	Evaluate the major two classifications of overvoltage.	BTL 6	Create	CO5
24	How does temporary overvoltage differ from switching overvoltage?	BTL 3	Apply	CO5

Part-B				
1	Discuss in detail about EMTP for the applications of transient computation. (13)	BTL 6	Create	CO5
2	Discuss about the distribution of voltage in a power system. Derive the voltage transient on closing lines. (13)	BTL 2	Understand	CO5
3	Analyze the computation of Transients in power system using EMTP. (13)	BTL 4	Analyze	CO5
4	Examine the switching surges in a power system and also outline the concept of line dropping and load rejection in a power system. (13)	BTL 4	Analyze	CO5
5	Interpret the need for simulation studies. Also describe the key points of EMTP software and the steps involved to do a simulation study of a sample power system. (13)	BTL 3	Apply	CO5
6	Develop an expression for response and recovery voltage of a shorted line. (13)	BTL 5	Evaluate	CO5
7	Discuss the causes of transients on closing and reclosing of transmission lines. (13)	BTL 2	Understand	CO5
8	Discuss in detail about the switching surges on an integrated power system. (13)	BTL 2	Understand	CO5
9	Evaluate the reflection and transmission coefficient in an integrated power system. (13)	BTL 1	Remember	CO5
10	Describe in detail about the causes of over voltages induced by various faults occurring in a power System. (13)	BTL 1	Remember	CO5
11	Discuss in detail about kilometric fault with necessary diagrams, expression and voltage and recovery voltage waveforms. (13)	BTL 2	Understand	CO5
12	Explain the voltage transients on closing and reclosing of lines and switching surges on integrated systems. (13)	BTL 3	Apply	CO5
13	Explore the algorithm used for computation of transient voltages in EMTP. (13)	BTL 6	Create	CO5
14	Evaluate over voltages induced by Line-to-Line fault. (13)	BTL 1	Remember	CO5
15	Explain the causes of load rejection overvoltage. (13)	BTL 2	Understand	CO5
16	Explain the temporary overvoltage are differing from switching overvoltage. (13)	BTL 3	Apply	CO5
17	Summarize the EMTP representation of equivalent current source. (13)	BTL 6	Create	CO5
Part-C				
1	With a suitable illustration discuss computation mechanisms and algorithms for analyzing the transients in integrated power systems. (15)	BTL 6	Create	CO5
2	Evaluate the reflection and transmission coefficient in an integrated power system. (15)	BTL 5	Evaluate	CO5
3	Describe the causes of over voltages induced by various faults in a power system. (15)	BTL 5	Evaluate	CO5
4	Explain in detail about the switching surges on an integrated power system. (15)	BTL 6	Create	CO5
5	Generalize the EMTP for Transient computation. (15)	BTL 6	Create	CO5