

Code No: R203202D

R20

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**  
**III B.Tech II Semester Supplementary Examinations, November-2025**  
**SWITCH GEAR AND PROTECTION**  
**(EEE)**

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**  
 All Questions Carry Equal Marks

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		<u><b>UNIT-I</b></u>	
1.	a)	Discuss the arc interruption theories of circuit breakers.	[7M]
	b)	Discuss the principle of operation of an air-blast circuit breaker and mention its advantages and disadvantages.	[7M]
		(OR)	
2.	a)	What is the significance of Restriking voltage? Derive the expression for Restriking Voltage and RRRV.	[7M]
	b)	Discuss the principle of operation of a vacuum circuit breaker and mention its advantages and disadvantages.	[7M]
		<u><b>UNIT-II</b></u>	
3.	a)	Explain the theory of the induction relay with a neat diagram and derive the torque equation.	[7M]
	b)	Construct the universal torque equation of protective relay from the fundamentals. How do you derive various distance relay characteristics from the torque equation?	[7M]
		(OR)	
4.	a)	Classify various protection schemes and protective relays. Mention its applications.	[7M]
	b)	List out various types of distance relays and illustrate their functioning.	[7M]
		<u><b>UNIT-III</b></u>	
5.	a)	“The differential protection scheme cannot provide 100% protection for a phase-to-Earth fault of the generator”. Explain.	[7M]
	b)	What is the Buchholz relay? Which equipment is it protecting? For what types of faults is it employed? Discuss its working principle.	[7M]
		(OR)	
6.	a)	Explain the operation of the circulating current protection scheme for earth fault protection of the alternator with a neat diagram.	[7M]
	b)	A 3-phase transformer of 220/11,000 line volts is connected in star/delta. The protective transformers on 220 V side have a current ratio of 600/5. What should be the CT ratio on 11,000 V side?	[7M]
		<u><b>UNIT-IV</b></u>	
7.	a)	Explain the protection of bus bars by using differential protection.	[7M]

	b)	The current setting of a relay is 5A, PSM = 1.5, TMS = 0.4, CT ratio = 400/5, and fault current = 6000A. At TMS = 1, the operating times for various PSMs are as follows: <table><tr><td>PSM</td><td>2</td><td>4</td><td>5</td><td>8</td><td>10</td><td>20</td></tr><tr><td>Operating time (sec)</td><td>10</td><td>5</td><td>4</td><td>3</td><td>2.8</td><td>2.4</td></tr></table>	PSM	2	4	5	8	10	20	Operating time (sec)	10	5	4	3	2.8	2.4	[7M]
PSM	2	4	5	8	10	20											
Operating time (sec)	10	5	4	3	2.8	2.4											
		(OR)															
8.	a)	Describe the importance of the carrier-current method of feeder protection and mention its advantages.	[7M]														
	b)	Demonstrate the differential protection scheme used to protect star/delta transformers with a neat circuit diagram.	[7M]														
		<u><b>UNIT-V</b></u>															
9.	a)	Explain about arcing grounds and grounding practices.	[7M]														
	b)	Discuss the operation principle of a valve-type lightning arrester with a neat diagram.	[7M]														
		(OR)															
10.	a)	What are the causes of overvoltage arising in a power system? Why is it necessary to protect the lines and other equipment of the power system against overvoltages?	[7M]														
	b)	Discuss the operation principle of a zinc oxide gapless arrester with a neat diagram.	[7M]														

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