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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; July / Aug. - 2022

Switchgear and Protection

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Select a fuse and/or a circuit breaker for a given application.

CO2: Distinguish between various types of circuit breakers and analyze the operation principles of circuit breakers and its arc extinction.

CO3: Compare the characteristic of different relays and selection criteria.

CO4: Understand and analyze the different protection scheme for Generator.

CO5: Understand and analyze the different protection scheme for Transformers and Induction motors.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.		Questions	Marks	BLs	COs
		I : PART - A	**10**		
I	a.	Define transient recovery voltage and recovery voltage.	2	L1	CO1
	b.	List different modes of arc Interruption.	2	L1	CO2
	c.	List the methods of backup protection.	2	L1	CO3
	d.	Explain the principle of Merz – price protection.	2	L1	CO4
	e.	Mention the limitations of Buchholz relay.	2	L1	CO5
		II : PART - B	**90**		
		UNIT - I	**18**		
1	a.	With relevant sketches, explain the construction and operation of HRC fuse.	9	L1	CO1
	b.	A 3-phace alternator has the line voltage of 11 kV. The generator is connected to a circuit breaker. The inductive reactance up to circuit breaker is 5 Ω/ph. The distributed capacitance upto circuit breaker between phase and neutral is 0.01 μF. Determine; i) Peak re-striking voltage ii) Frequency of re-striking voltage transient iii) Average rate of rise of re-striking voltage upto peak re-striking voltage iv) Max R.R.R.V (neglect first pole to, clear factor)	9	L3	CO1
	c.	Discuss capacitance switching and resistance switching with neat sketches.	9	L2	CO1
		UNIT - II	**18**		
2	a.	Explain the construction and working of air blast circuit breaker with neat sketch.	9	L2	CO2
	b.	List the physical, chemical and dielectric properties of SF_6 gas.	9	L2	CO2
	c.	Explain the construction and working of vacuum air circuit breaker with a neat sketch.	9	L2	CO2

Contd... 2

	UNIT - III	**18**		
3 a.	Describe the essential qualities of protective relay.	9	L3	CO1
b.	With a neat sketch explain the construction and working of a directional over current relay.	9	L2	CO3
c.	With a neat sketch explain the operation of percentage differential relay.Alsodiscuss the operating characteristics.	9	L2	CO3
	UNIT - IV	**18**		
4 a.	Discuss different stator winding faults in generator.	9	L2	CO4
b.	Explain differential protection of alternator stator windings with a circuit diagram for Y-connected alternator.	9	L2	CO4
c.	Explain the operation of restricted earth fault protection scheme.	9	L2	CO4
	UNIT - V	**18**		
5 a.	With a neat sketch, explain the construction and operation of a Buchholz relay.	9	L2	CO5
b.	Discuss biased differential protection of power transformer with relevant sketches.	9	L2	CO5
c.	Explain abnormal conditions and possible failure of induction motor.	9	L2	CO5

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