Q. Code:611812

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

B. E / B. TECH.DEGREE EXAMINATIONS, MAY 2024

Seventh Semester

EE18701 PROTECTION AND SWITCHGEAR

(Electrical and Electronics Engineering)

(Regulation 2018)

TIME:3 HOURS **MAX. MARKS: 100**

Course Outcomes	Statements	RBT Level
CO1	Interpret the faults in power system and essential qualities of protection	**4**
CO2	Understand the operation of various electromagnetic relays.	**4**
CO3	Analyze the protection schemes for power system apparatus.	**4**
CO4	Synthesize various relays using static comparators and microcontroller.	**4**
CO5	Analyze the circuit breaker arcing phenomenon and understand the functioning of various types of circuit breakers	**4**

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	List out the consequences of a short circuit.	**1**	**2**
2.	Compare Primary and Back up protection.	**1**	**2**
3.	A relay is connected to 400/5 ratio current transformer with current setting of 150%. Calculate the Plug Setting Multiplier when circuit carries a fault current of 2400 A.	**2**	**3**
4.	Justify the purpose of universal torque equation.	**2**	**4**
5.	What are the advantages of carrier aided protection of transmission lines?	**3**	**2**
6.	Identify the limitations of Buchholz relay.	**3**	**3**
7.	What are amplitude and phase comparators?	**4**	**2**
8.	Differentiate between conventional and numerical relays.	**4**	**4**
9.	What is resistance switching?	**5**	**2**
10.	Differentiate Fuse and circuit breaker.	**5**	**4**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Discuss the essential qualities of protective relaying system.	**(7)**	**1**	**2**
	(ii)	Describe fault current calculation using symmetrical components for a Line to Ground fault.	**(7)**	**1**	**2**
		(OR)			
(b)		Explain various methods of effective and non-effective neutral grounding.	**(14)**	**1**	**2**

				Marks	CO	RBT LEVEL
12. (a)		Elaborate the operating principles, conditions, characteristics (R-X diagram), and applications of mho relays.		**(14)**	**2**	**3**
		(OR)				
(b)	**(i)**	Elaborate the classification of over-current relays based on time-current characteristics.		**(10)**	**2**	**3**
	(ii)	What is an under frequency relay and why it is required?		**(4)**	**2**	**3**
13. (a)	**(i)**	Differentiate between Unit and Non – Unit Protection Schemes.		**(04)**	**3**	**3**
	(ii)	Why is harmonic restrained differential relay used for protecting large size transformer? Describe its design and working.		**(10)**	**3**	**3**
		(OR)				
(b)		Design Merz-price protection scheme for alternator and analyze its operation for internal and external faults.		**(14)**	**3**	**3**
14. (a)		Design static impedance, reactance and Mho relays using amplitude comparators.		**(14)**	**4**	**3**
		(OR)				
(b)		Discuss the design steps of typical numerical differential protection scheme for the transformer.		**(14)**	**4**	**3**
15. (a)	**(i)**	A circuit breaker is rated as 1750 A, 1000 MVA, 33 kV, 3-second, 3-phase oil circuit breaker. Find (i) rated symmetrical breaking current/capacity (ii) rated making current/capacity (iii) short-time rating.		**(06)**	**5**	**3**
	(ii)	Explain the methods of arc extinction.		**(08)**	**5**	**3**
		(OR)				
(b)	**(i)**	For a 132kV system, the reactance and capacitance up to the location of the circuit breaker is 3.2 ohms and 0.015 micro farad, respectively. Calculate, (a) The maximum value of restriking voltage across the contacts of the circuit breaker. (b)The maximum value of RRRV.		**(06)**	**5**	**3**
	(ii)	Discuss the selection of circuit breakers for different ranges of system voltages.		**(08)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

				Marks	CO	RBT LEVEL
16.		A 25 MVA, 13.2 kV alternator with solidly grounded neutral has a sub-transient reactance of 0.45 p.u. The negative and zero sequence reactance are 0.55 and 0.25 p.u. respectively. Determine the circuit breaker rating for three phase and LLG faults at the terminals of an unloaded alternator and examine the results. Neglect resistance.		**(10)**	**5**	**4**

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