Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

EE2CO17 Switchgear & Protection

Programme: Diploma Branch/Specialisation: EE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. What is the value of (1+ a + a2)? **1**

(a) 0 (b) 1 (c) -1 (d) ∞

ii. Which among these is the most commonly occurring fault? **1**

(a) Single line to ground fault.
(b) Double line to ground fault
(c) Line to line fault
(d) Fault due to all the three phases to earth.

iii. Which among these is the least expensive protection for over current in low voltage system? **1**

(a) Rewireable fuse (b) Isolator
(c) Circuit breaker (d) Air breaker switch

iv. Which among these are the main characteristics of a fuse element? **1**

(a) Low melting point
(b) High conductivity
(c) Least deterioration due to oxidation
(d) All of these

v. What is / are the main disadvantage / s of using oil as the quenching medium in the circuit breakers? **1**

(a) Need periodical replacement.
(b) Risk of formation of explosive mixture with air.
(c) Possibility of causing fire hazards.
(d) All of these

P.T.O.

vi. A circuit breaker is **1**
(a) Power factor correcting device
(b) A device to neutralize the effect of transients
(c) A waveform correcting device
(d) A current interrupting device.

vii. Which component ensures the safety of the line from damage? **1**
(a) Relay (b) Circuit breaker
(c) Bus bar (d) Current transformer

viii. The tripping circuit is_____ **1**
(a) AC (b) DC
(c) Either AC or DC (d) None of these

ix. Connection of the various parts of a circuit to earth has a **1**
(a) Medium resistance (b) High resistance
(c) Very high resistance (d) Very low resistance

x. Which of the following protective devices can be used against lightning surges? **1**
(a) Horn gap (b) Surge diverters
(c) Lightning arresters (d) Any of these

Q.2 i. What is per unit system? Explain its advantages. **4**
ii. Express unbalanced phase currents in a 3 phase system in terms of symmetrical components. **6**
OR iii. Derive an expression for fault current and phase voltage for line to line fault by symmetrical components method. **6**

Q.3 i. What is a fuse? Write down its advantages and disadvantages. **4**
ii. With a neat sketch, explain the construction and working of HRC cartridge fuse. **6**
OR iii. Explain terms: **6**
(a) Fusing current (b) Cut off current
(c) Operating time

Q.4 i. Describe the operating principle of circuit breaker. **4**
ii. Explain the various methods of arc extinction in a circuit breaker. **6**

OR iii. Describe construction, operating principle and application of SF6 circuit breaker. **6**

Q.5 i. What is protective relay? Explain its function in an electrical system. **4**
ii. Describe the construction and principle of operation of an induction type directional over current relay. **6**
OR iii. Define and explain the following terms as applied to protective relaying: **6**
(a) Pick up value (b) Current setting
(c) Plug setting multiplier

Q.6 Attempt any two:
i. What is a voltage surge? What are the causes of over voltages? **5**
ii. What is lightning? Describe the mechanism of lightning discharge **5**
iii. What is surge diverter? What is the basic principle of operation of a surge diverter? **5**

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Marking Scheme
EE2CO17 Switchgear & Protection

Q.1	i.	What is the value of (1+ a + a2)? (a) 0	**1**
	ii.	Which among these is the most commonly occurring fault? (a) Single line to ground fault.	**1**
	iii.	Which among these is the least expensive protection for over current in low voltage system? (a) Rewireable fuse	**1**
	iv.	Which among these are the main characteristics of a fuse element? (d) All of these	**1**
	v.	What is / are the main disadvantage / s of using oil as the quenching medium in the circuit breakers? (d) All of these	**1**
	vi.	A circuit breaker is (d) A current interrupting device.	**1**
	vii.	Which component ensures the safety of the line from damage? (a) Relay	**1**
	viii.	The tripping circuit is_____ (c) Either AC or DC	**1**
	ix.	Connection of the various parts of a circuit to earth has a (d) Very low resistance	**1**
	x.	Which of the following protective devices can be used against lightning surges? (d) Any of these	**1**

Q.2	i.	Per unit system	2 marks	**4**
		Its advantages.	2 marks	
	ii.	Unbalanced phase currents in a 3 phase system		**6**
		2 marks for each component	(2 marks * 3)	
OR	iii.	Line to line fault diagram	1 mark	**6**
		Reactance diagram	1 mark	
		Expression for fault current	2 marks	
		Expression for phase voltage	2 marks	

Q.3	i.	Definition of fuse	2 marks	**4**
		Its advantages	1 mark	
		Its disadvantages.	1 mark	
	ii.	Construction and working of HRC cartridge fuse.		**6**
		Diagram	1 mark	
		Construction	2 marks	
		Working operation	3 marks	
OR	iii.	Explain terms:		**6**
		(a) Fusing current	2 marks	
		(b) Cut off current	2 marks	
		(c) Operating time	2 marks	

Q.4	i.	Operating principle of circuit breaker.		**4**
		Definition	1 mark	
		Working operation	3 marks	
	ii.	Methods of arc extinction	3 marks	**6**
		Explanation of arc extinction	3 marks	
OR	iii.	Diagram	1 mark	**6**
		Construction	1 mark	
		Operating principle	3 marks	
		Application of SF6 circuit breaker.	1 mark	

Q.5	i.	Definition of protective relay	2 marks	**4**
		Its function in an electrical system.	2 marks	
	ii.	Induction type directional over current relay.		**6**
		Diagram	1 mark	
		Construction	2 marks	
		Principle of operation	3 marks	
OR	iii.	Define and explain the following terms as applied to protective relaying:		**6**
		(a) Pick up value	2 marks	
		(b) Current setting	2 marks	
		(c) Plug setting multiplier	2 marks	

Q.6		Attempt any two:		
	i.	Definition of voltage surge	2 marks	**5**

	Causes of over voltages	3 marks	
ii.	Definition of lightning	2 marks	**5**
	Mechanism of lightning discharge	3 marks	
iii.	Definition of surge diverter	2 marks	**5**
	Principle of operation of a surge diverter	3 marks	

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