



Faculty of Engineering

End Semester Examination May 2025

EE3CO46 Power System Protection

Programme	:	B.Tech.	Branch/Specialisation	:	EE
Duration	:	3 hours	Maximum Marks	:	60

Note: All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Section 1 (Answer all question(s))					Marks	CO	BL
Q1.	Which among these is the most severe fault?				1	1	1
	<input type="radio"/> Single line to ground fault.	<input type="radio"/> Double line to ground fault					
	<input type="radio"/> Line-to-line fault	<input checked="" type="radio"/> Symmetrical fault					
Q2.	What is the value of zero sequence impedance in line-to-line faults?				1	1	1
	<input type="radio"/> $Z_0 = 1$	<input checked="" type="radio"/> $Z_0 = 0$					
	<input type="radio"/> $Z_0 = 3Z_n$	<input type="radio"/> $Z_0 = \infty$					
Q3.	The voltage appearing across the contacts after the opening of the circuit breaker is called _____.				1	1	1
	<input type="radio"/> Arc voltage	<input checked="" type="radio"/> Recovery voltage					
	<input type="radio"/> Surge voltage	<input type="radio"/> Break open voltage					
Q4.	In extra voltage lines, which of the following circuit breakers are most suitable?				1	1	1
	<input checked="" type="radio"/> SF ₆ circuit breakers	<input type="radio"/> Air circuit breakers					
	<input type="radio"/> Oil circuit breakers	<input type="radio"/> Vacuum circuit breakers					
Q5.	Which of the following is an instantaneous relay?				1	1	1
	<input type="radio"/> Induction type	<input type="radio"/> Shaded pole type					
	<input type="radio"/> Thermocouple type	<input checked="" type="radio"/> Permanent magnet moving coil type					
Q6.	Mho relay is normally used for the protection of:				1	1	1
	<input checked="" type="radio"/> Long transmission line	<input type="radio"/> Medium length lines					
	<input type="radio"/> Short length lines	<input type="radio"/> No length criterion					
Q7.	The purpose of backup protection is-				1	1	1
	<input type="radio"/> To increase the speed	<input type="radio"/> To increase the reach					
	<input type="radio"/> To leave no blind spot	<input checked="" type="radio"/> To guard against failure of a primary					
Q8.	Pilot wire protection is for-				1	1	1
	<input type="radio"/> Overhead lines	<input type="radio"/> Transformer					
	<input type="radio"/> Motors	<input checked="" type="radio"/> Cables					
Q9.	Lightning arresters are-				1	1	1
	<input type="radio"/> Surge reflectors	<input checked="" type="radio"/> Surge diverters					
	<input type="radio"/> Surge absorbers	<input type="radio"/> Surge attenuators					
Q10.	Which of the following is the protective device against lightning overvoltages?				1	1	1
	<input type="radio"/> Rod gaps	<input type="radio"/> Surge absorbers					
	<input type="radio"/> Horn gaps	<input checked="" type="radio"/> All of the above					

Section 2 (Answer all question(s))

Marks CO BL

- Q11.** Explain symmetrical and unsymmetrical faults in power system. Give example of symmetrical and unsymmetrical faults. 3 2 2

Rubric	Marks
What are symmetrical and unsymmetrical faults in power system?	2
Give example of symmetrical and unsymmetrical faults.	1

- Q12. (a)** Explain the symmetrical component of the power system in short. Explain L-L fault with fault impedance Z_F . 7 3 3

Rubric	Marks
Explain the symmetrical component of the power system in short.	2
Explanation about the L-L fault with fault impedance Z_F	5

(OR)

- (b)** A balanced star-connected load takes 100A from a balanced 3-phase, 4-wire supply. If the fuses in the Y and B phases are removed. Find the symmetrical components of the line currents.
 (i) Before the fuses are removed
 (ii) After the fuses are removed

Rubric	Marks
(i) Before the fuses are removed. the symmetrical components before the fuse removal are: $I_1 = 100 \text{ A}$, $I_2 = 0 \text{ A}$, $I_0 = 0 \text{ A}$	3
(ii) After the fuses are removed the symmetrical components after the fuse removal are: $I_0 = 100/3 \text{ A}$, $I_1 = 100/3 \text{ A}$, $I_2 = 100/3 \text{ A}$	4

Section 3 (Answer all question(s))

Marks CO BL
4 2 2

- Q13.** Explain the following terms-
 (a) Restriking voltage
 (b) Recovery voltage

Rubric	Marks
Explanation of Restriking Voltage	2
Explanation of Recovery Voltage	2

- Q14. (a)** Explain the principle of arc extinction in air-blast circuit breaker. Write different methods of arc quenching. 6 3 3

Rubric	Marks
Explain the principle of arc extinction in air-blast circuit breaker	3
Write different methods of arc quenching.	3

(OR)

- (b)** Explain the concept of current chopping and resistance switching in circuit breakers.

Rubric	Marks
Explanation about the current chopping in circuit breakers.	3
Explanation about the resistance switching in circuit breakers.	3

Section 4 (Answer all question(s))

Marks CO BL

Q15. Explain the basic principle of operation of a percentage differential relay.

3 2 2

Rubric	Marks
The basic principle of operation of a percentage differential relay.	3

Q16. (a) Explain the working of induction-type directional overcurrent relay with a suitable diagram. Also, support the answer with suitable mathematical relationships.

7 3 1

Rubric	Marks
Explanation about the working of induction-type directional overcurrent relay	2
Diagram. of induction-type directional overcurrent relay	2
Also, support the answer with suitable mathematical relationships.	3

(OR)

(b) Explain static relays with a suitable block diagram. Also, classify the static relays.

Rubric	Marks
Static Relay block diagram	2
Explanation about static relays	3
classify the static relays.	2

Section 5 (Answer all question(s))

Marks CO BL

Q17. What are the various abnormal conditions in synchronous generators? Explain any one.

4 2 2

Rubric	Marks
What are the various abnormal conditions in synchronous generators?	2
Explain anyone.	2

Q18. (a) Discuss the different transformer faults. What are the various protection schemes available for transformers?

6 3 3

Rubric	Marks
Discuss the different transformer faults.	4
What are the various protection schemes available for transformers?	2

(OR)

(b) A 3-phase transformer having a line-voltage ratio of 400V/11kV is connected in star-delta and protective transformers on the 400 V side have a current ratio of 500/5. What must be the ratio of the protective transformers on the 11 kV side.

Rubric	Marks
The required CT ratio for the 11 kV side is 100/5.	6

Section 6 (Answer any 2 question(s))

Marks CO BL

Q19. What are the different types of lightning arrestors? Describe them in detail.

5 2 1

Rubric	Marks
What are the different types of lightning arrestors?	2
Describe them in detail.	3

Q20. Explain the phenomena of lightning and protection against lightning.

5 2 2

Rubric	Marks
lightning	2
protection against lightning	3

Q21. Explain the differential protection scheme for the protection of the bus bar.

5 2 2

Rubric	Marks
Explain the differential protection scheme for the protection of the bus bar.	5
