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Question Paper Code: AEE014



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech VII Semester End Examinations, November - 2019

Regulations: R16

POWER SYSTEM PROTECTION

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. a) Explain the following terms as applied to circuit breakers : [7M]
 (i) Arc voltage (ii) Re striking voltage (iii) Recovery voltage
- b) Write a short note on the rate of re-striking voltage indicating its importance in the arc extinction? [7M]

2. a) Discuss the principle of operation of an air-blast circuit breaker. What are the advantages and disadvantages of using air as the arc quenching medium? [7M]
- b) Describe construction, operating principle and application of vacuum circuit breaker. For what voltage range is it recommended? [7M]

UNIT – II

3. a) Describe the operating principle, constructional features and area of applications of reverse power or directional relay. [7M]
- b) Explain with the help of neat diagram the construction and working of Induction type directional power relay. [7M]

4. a) Explain with the help of neat diagram the construction and working of Non-directional induction type over current relay [7M]
- b) 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 4000A [7M]

UNIT – III

5. a) Draw the single line diagram, show the location of substation equipment's for the following bus bar arrangements. i) Single bus bar and ii) Main and transfer bus bar. [7M]
- b) What are the different bus-bar arrangements possible in a substation? Discuss them briefly with application areas? [7M]

6. a) Describe following corresponding to gas insulated substation i) Current transformer [7M]
ii). Earth switch.
b) Write short notes on the following (i) Necessity of bus-bar protection? [7M]
(ii) bus bar arrangement (iii) differential protection of bus bar

UNIT – IV

7. a) Describe the protection scheme for internal faults in a three phase delta/star connected [7M]
power transformer. Draw a neat sketch and explain clearly why the CTs are to be
connected in a particular fashion only.
b) Describe the Merz-Price circulating current system for the protection of transformers. [7M]
8. a) Describe the protection scheme for internal faults in a three phase delta/star connected [7M]
power transformer. Draw a neat sketch and explain clearly why the CTs are to be
connected in a particular fashion only.
b) What protective devices other than differential protection are used for the protection of a [7M]
large transformer? Briefly describe them .

UNIT – V

9. a) Write short notes on the following surge diverters [7M]
a) Rod gap diverter
b) Horn gap diverter
b) Name different types of lightening arresters used now-a-days in protecting equipment [7M]
and overhead line.
10. a) What is a ground wire? What are the requirements to be satisfied by ground wires to [7M]
provide efficient protection to lines against direct lightening strokes?
b) Discuss the phenomenon of lightning stroke. How can wave set up by such a stroke be [7M]
represented?



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COURSE OBJECTIVES:

The course should enable the students to:

I	Understand types of various circuit breakers.
II	Classify relays into various types such as of electromagnetic, static and numerical relays.
III	Evaluate the performance of protection schemes of generator and transformer.
IV	Analyze the performance of feeder and bus-bar protection.
V	Discuss the protection schemes against over voltages.

COURSE OUTCOMES (COs):

CO 1	Understand the working of various types of circuit breakers and protective equipments of power systems
CO 2	Understand the working of various protective relays.
CO 3	Discuss about various components of substation and understand protection of feeders and bus bars.
CO 4	Understand the various faults and protection methods for the Generators and Transformers.
CO 5	Understand the various protection schemes of power system against over voltages.

COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEE014.01	CLO 1	Understand various types of faults in Power system.	PO1, PO3	2
AEE014.02	CLO 2	Apply the knowledge on different Protective Equipments of Power Systems.	PO2, PO3	2
AEE014.03	CLO 3	Understand concept of recovery and restriking voltages.	PO1, PO3	3
AEE014.04	CLO 4	Understand working of various protective systems.	PO1, PO3	3
AEE014.05	CLO 5	Compare the different type of circuit breakers performance based on which selection of circuit breaker can be made for a given application.	PO2, PO3	2
AEE014.06	CLO 6	Discuss the construction and working of Fuse and circuit breakers.	PO2, PO3	2
AEE014.07	CLO 7	Explain working of protective relays.	PO2, PO3	2
AEE014.08	CLO 8	Understand the concept of DMT, IDMT type relays.	PO1, PO2	3
AEE014.09	CLO 9	Understand layout of Substations.	PO2, PO3	2
AEE014.10	CLO 10	Understand layout of Substations, neutral earthling, testing of CB, CT and PT.	PO1, PO2	3
AEE014.11	CLO 11	Remember the faults and protection for the Feeders and Bus-Bars.	PO2, PO3	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEE014.12	CLO 12	Understand and justify a suitable protection system for a specified application.	PO1, PO2	3
AEE014.13	CLO 13	Understand the faults and protection for the Generators and Transformers.	PO1, PO2	2
AEE014.14	CLO 14	Understand Rotor, Stator Faults, inter turn faults and their protection.	PO2, PO3	3
AEE014.15	CLO 15	Understand the protection of power system against over voltages.	PO1, PO2	2

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No	Course Learning Outcomes			Course Outcomes	Blooms Taxonomy Level
1	a	AEE014.01	Understand various types of faults in Power system	CO 1	Understand
	b	AEE014.02	Apply the knowledge on different Protective Equipments of Power Systems.	CO 1	Understand
2	a	AEE014.03	Understand concept of recovery and restriking voltages	CO 1	Understand
	b	AEE014.05	Compare the different type of circuit breakers performance based on which selection of circuit breaker can be made for a given application.	CO 1	Remember
3	a	AEE014.07	Explain working of protective relays.	CO 2	Understand
	b	AEE014.08	Understand the concept of DMT, IDMT type relays.	CO 2	Remember
4	a	AEE014.07	Explain working of protective relays.	CO 2	Understand
	b	AEE014.08	Understand the concept of DMT, IDMT type relays.	CO 2	Remember
5	a	AEE014.09	Understand layout of Substations.	CO 3	Understand
	b	AEE014.11	Remember the faults and protection for the Feeders and Bus-Bars.	CO 3	Remember
6	a	AEE014.09	Understand layout of Substations.	CO 3	Understand
	b	AEE014.11	Remember the faults and protection for the Feeders and Bus-Bars.	CO 3	Remember
7	a	AEE014.13	Understand the faults and protection for the Generators and Transformers.	CO 4	Understand
	b	AEE014.14	Understand Rotor, Stator Faults, inter turn faults and their protection.	CO 4	Remember
8	a	AEE014.13	Understand the faults and protection for the Generators and Transformers.	CO 4	Understand
	b	AEE014.13	Understand the faults and protection for the Generators and Transformers.	CO 4	Understand
9	a	AEE014.15	Understand the protection of power system against over voltages.	CO 5	Remember
	b	AEE014.15	Understand the protection of power system against over voltages.	CO 5	Understand
10	a	AEE014.15	Understand the protection of power system against over voltages.	CO 5	Remember
	b	AEE014.15	Understand the protection of power system against over voltages.	CO 5	Understand

Signature of Course Coordinator

HOD, EEE