

Code No: RT32022

R13

SET - 1

III B. Tech II Semester Regular Examinations, April - 2016

SWITCHGEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 hours

Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answering the question in **Part-A** is compulsory

3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) What are various rating of a circuit breaker? [3M]
- b) What is protective relay? Give its fundamental requirements. [4M]
- c) What is earth fault? [4M]
- d) What is differential protection? [4M]
- e) List the advantages of static relays. [3M]
- f) Explain the need for a lightning arrester. [4M]

PART -B

- 2 a) Discuss the rate of rise of restriking voltage and explain its importance in arc extinction. [8M]
- b) Explain the working of a SF₆ circuit breaker. [8M]
- 3 a) Explain the working of differential relays. [4M]
- b) Describe the functionality of a mho relay. [7M]
- c) Compare various types of distance relays. [5M]
- 4 a) What are various faults that occur in the rotor of an alternator and how the rotor is to be protected from these faults? [8M]
- b) Explain in detail about Bucholtz relay with a neat sketch. [8M]
- 5 a) Draw the schematic diagram of the carrier current protection scheme of lines. Also explain its working principle. [8M]
- b) What is the principle of differential relays? Explain their characteristics and limitations? [8M]
- 6 a) List the advantages and disadvantages of microprocessor based relays. [8M]
- b) With the help of neat diagram explain the principle of static differential relay? [8M]
- 7 a) Describe the construction, principle of operation and application of valve type lightning arrester? [8M]
- b) What are the different types of grounding? Explain the reactance grounding? [8M]



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PART -A

- 1 a) What is meant by current chopping? [3M]
- b) Why directional feature provided for impedance relay cannot be used for reactance relay? [3M]
- c) List the different types of Generator faults. [4M]
- d) What is magnetizing inrush current? [4M]
- e) Explain the importance of zero cross detector in static relays. [3M]
- f) Why is grounding required? [4M]

PART -B

- 2 a) Describe the construction and working of an SF₆ circuit breaker? [9M]
- b) A 11 KV, 400 MVA circuit breaker suddenly closes on to a fault. Determine [7M]
 - (i) symmetrical breaking current
 - (ii) Asymmetrical breaking current assuming 50% DC component
 - (iii) Peak making current.
- 3 a) Discuss with necessary circuit diagram, the principle of operation of an induction disc relay. What are the advantages of induction cup relays over induction disc relays? [8M]
- b) What is universal torque equation? Using this equation derive the characteristics of [8M]
 - (i) impedance relay (ii) reactance relay (iii) mho relay.
- 4 a) Explain the construction and principle of operation of a Buchholz relay. [8M]
- b) Describe with a neat sketch the percentage differential protection of a modern alternator. [8M]
- 5 a) Explain in detail about the Merz price voltage balanced system with a neat single line diagram. [8M]
- b) Describe in detail the protection of parallel feeder and ring mains. [8M]
- 6 a) Describe the basic functional blocks of a digital relay. [8M]
- b) Explain the working of a static over current relay. [8M]
- 7 a) What is the function of surge absorber? In what way it is different from lightning arrester? [8M]
- b) State the advantages of neutral grounding of an electrical system. Give a connection diagram of typical arc suppression coil. [8M]

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PART -A

- | | | | |
|---|----|---------------------------------------------------------------------|------|
| 1 | a) | Define restriking voltage? | [3M] |
| | b) | What type of relays is affected by power swings? | [4M] |
| | c) | What type of relay is used for loss of excitation of an alternator? | [4M] |
| | d) | What is the commonly used protection for 3 phase feeders? | [4M] |
| | e) | What are the advantages of static over current relays? | [3M] |
| | f) | What is expulsion gap lightning arrester? | [4M] |

PART -B

- | | | | |
|---|----|--------------------------------------------------------------------------------------------------------------------|-------|
| 2 | a) | Explain the reason for initiation of electric arc during contact separation. | [7M] |
| | b) | Describe with the aid of neat sketch the working of a air blast circuit breaker. | [9 M] |
| 3 | a) | Explain the requirement of primary and back up protection in any equipment. | [8M] |
| | b) | Explain in detail about the Induction disc type relay with a neat sketch. | [8M] |
| 4 | a) | Explain a scheme of protection for failure of alternator excitation. | [8M] |
| | b) | Discuss the different types of transformer faults. What are various protective schemes available for transformers? | [8M] |
| 5 | a) | Explain in detail about the time graded and current graded system. | [8M] |
| | b) | Explain the construction and principle of operation of a translay relay applied to a single phase system. | [8M] |
| 6 | a) | Write the pseudo code for programming the distance relays on the microprocessor. | [8M] |
| | b) | Explain in detail about the static over current relay. | [8M] |
| 7 | a) | Discuss the causes of over voltages in a power system. | [8M] |
| | b) | Explain the different methods of neutral grounding. | [8M] |



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PART -A

- 1 a) Define recovery voltage [3M]
- b) What are the merits of over current relays? [4M]
- c) List the faults that occur in Rotor of a generator. [4M]
- d) What type of relay is used for feeder protection [4M]
- e) What are the disadvantages of microprocessor relays? [3M]
- f) What is lightning discharge? [4M]

PART -B

- 2 a) Explain in detail about Air blast circuit breaker with a neat circuit diagram. [4M]
- b) The following data refers to a 3 phase, 50 Hz generator. EMF between the lines 7.5 kV, reactance of generator and connected systems 4 Ohm, distributed capacitance to neutral 0.01microfarad, calculate the frequency of restriking voltage transient. [8M]
- c) Discuss performance of a circuit breaker when capacitive currents are interrupted [3M]
- 3 a) Explain the characteristics of distance relays. [8M]
- b) Explain the importance of under voltage/ over voltage relays with an example for each. [8M]
- 4 a) Explain split-phase relaying protection of a 3 phase alternator with relevant diagrams? [8M]
- b) Explain the protective scheme for the transformer that takes care of magnetizing inrush current without affecting the sensitivity. [8M]
- 5 a) Elaborate on various methods for protection of feeders. [8M]
- b) What is the importance of bus-bar protection? What are the requirements of protection of lines? [8M]
- 6 a) Explain the construction and working of static distance relay. [8M]
- b) Explain the different components of static relay with a neat block diagram. [8M]
- 7 a) Discuss the causes of over voltages in a power system. [8M]
- b) Explain the characteristics of standard impulse voltage. Why is it needed for testing? [8M]
