

SWITCHGEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 hours

Max. 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

(22 Marks)

- 1 a) What is the phenomenon of arc formation in a circuit breaker? [4M]
- b) What is the working principle of over current relay? [4M]
- c) Enumerate the various types of protections used in an alternator. [4M]
- d) What is meant by time graded system? [4M]
- e) List the static relay components. [3M]
- f) What are the functions of grounding in power system? [3M]

PART -B

(48 Marks)

- 2 Describe the construction, principle of operation and applications of SF₆ circuit breaker. Explain clearly the current chopping process in SF₆ circuit breakers. [16M]
- 3 a) Explain with a neat sketch the operation of an induction type over current relay. What are the functions of current and time multiplier settings associated with such a relay? [8M]
- b) Derive operation characteristics of an impedance and reactance relay. Explain how you provide direction features to these relays? [8M]
- 4 a) Explain the principle of Mertz-Price system of protection used for power transformers. What are the limitations of this scheme and how are they overcome? [8M]
- b) An 11 kV, 3-phase turbo alternator has a maximum rating of 100 MW at 0.8 p.f and its reactance is 0.1 p.u. It is equipped with differential current protection scheme. It is set to operate at fault current not less than 500A. Determine the magnitude of the neutral earthing resistance that leaves the 10% of the winding unprotected. [8M]
- 5 Describe the following system of bus bar protection: [16M]
 - i) Differential protection
 - ii) Faults bus protection.
- 6 a) Describe the realization of Static MHO relay and static reactance relays. [8M]
- b) Explain the advantages and disadvantages of microprocessor based digital relay with other relays. [8M]
- 7 a) What is lightening? Describe the mechanism of lighting discharge by drawing suitable diagrams [8M]
- b) What are the various types of lighting arresters? Explain, with a neat sketch, the working of thyrite lightning arrester. [8M]
