

[06 – 4122]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

POWER SYSTEM PROTECTION

(Effective from the Admitted Batch of 2006–2007)

Time : Three hours

Maximum : 70 marks

Answer Question No. 1 and any FOUR from the remaining.

All questions carry equal marks.

1. (a) (i) What is transient recovery voltage?
(ii) What is fusing factor?
- (b) Define the term “Basic Insulation Level (BIL)” as applied to power system apparatus.
- (c) Name the desirable features of SF₆ gas with regard to its use in circuit breaker.
- (d) What are low resistance and high resistance methods of extinguishing the arc? What is rupturing capacity of a fuse?

- (e) How is lightning caused? Why is horn-gap lighting arrester not suitable in high voltage system?
 - (f) Give the principle of operation of a surge absorber.
 - (g) State the basic components of static relays.
- 2.
- (a) Explain the phenomenon of single frequency and double frequency transients.
 - (b) Explain, what is meant by cut off, pre-arcing time and arcing time of a HRC fuse. Explain the factors involved in the selection of a HRC fuse.
- 3.
- (a) Explaining clearly the difference between bulk oil and minimum oil circuit breakers. Draw a neat sketch of a modern minimum oil circuit breaker and explain its working.
 - (b) Explain the standard testing methods of circuit breakers.
- 4.
- (a) With the help of circuit diagram, discuss the protecting of parallel feeders.
 - (b) Compare and contrast static relays and electromagnetic relays.
 - (c) From the universal torque equation, derive the following characteristics :
Directional Relay, Impedance relay and MHO relay.

5. (a) Describe any type of impedance relay with neat sketches and show how such relays are connected in a transmission line and how they provide discriminating protection.
- (b) What is meant by back up relaying? Give the essential requirements of a good relaying scheme.
6. (a) Draw the layout of a typical underground substation.
- (b) Explain the mechanism of lightning discharge with neat sketches.
- (c) Differentiate between a surge absorber and a surge divider from the view point of the principle of operation.
7. (a) Explain with an example of an open ended transmission line, the concepts of reflections and refractions of travelling wave.
- (b) An overhead line with surge impedance of 400 ohms bifurcates into two lines of surge impedance of 400 ohms and 40 ohms respectively. If a surge of 20 KV is incident on the overhead line, determine the magnitudes of voltage and current which enter the bifurcated lines.

8. Write short notes on the following :

(a) Resistance switching in ABCB.

(b) Compare the relative performances of expulsion gap, rod gap and valve type lightning arrester.

(c) Bus bar design.