

B.Tech. IN ELECTRICAL ENGINEERING

Term-End Examination

December, 2012

BIEE-023 : SWITCHGEAR AND PROTECTION

Time : 3 hours

Maximum Marks : 70

Note : Answer any seven questions from ten questions.

1. What causes the initiation of electric arc at the instant of contact separation ? Which of these is chiefly responsible for the creation of arc in circuit breakers and why ? 10
2. Explain the terms of recovery voltage, restriking voltage and RRRV. Derive the expression for the restriking voltage in terms of system capacitance and inductance. 10
3. (a) Describe with a neat sketch the axial blast type of air-blast circuit breaker, its principle of operation and its limitations. 5
(b) Compare the performance and characteristics of minimum-oil breakers and air-blast breakers. 5
4. Show that a travelling wave moves along an overhead line with a velocity of light and its speed is proportional to $\frac{1}{\sqrt{\epsilon_r}}$ in case of a cable with dielectric material of relative permittivity ϵ_r . 10

5. Explain the protective characteristics of a lightning arrester against the with stand characteristics of equipment on a voltage-time curve. 10
6. Explain briefly the principle of time grading in a simple radial system equipped with instantaneous over current and earth-fault relays, and definite time-delay relays. Show how, by the use of directional relays, this same principle may be applied to the protection of a ring system, assuming the latter to be supplied at one point only. 10
7. What do you understand by time multiplier setting and plug multiplier setting in an over current relay ? Explain with the help of relay characteristic. Show why an IDMT characteristic is chosen in preference to simple inverse time characteristic. 10
8. Explain the basic features of a 3 -Zone stepped distance protection scheme for a long transmission line, employing mho characteristics for Zones 1 and 2, with an offset mho characteristic for Zone 3 and starting. Briefly comment on the following : 10
- (a) high source-to-line impedance ratio;
 - (b) differing effective impedances with different types of fault at a given point.

9. What are the abnormal conditions in a large synchronous generator against which protection is necessary ? Draw neatly the differential protection scheme of an alternator. Discuss its limitation and suggest remedies to overcome them. **10**
10. Write technical notes on following : **5x2=10**
- (a) Sampling circuits
 - (b) Time delay circuits
 - (c) Level detectors
 - (d) Zero crossing detectors
 - (e) Relay test benches.
-