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<b>Question Paper Code : 86598</b>
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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Electrical and Electronics Engineering

EE 1402 – POWER SYSTEM PROTECTION AND SWITCHGEAR

(Regulations 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Discuss some essential qualities of protection. -
2. How overvoltage due to lightning strokes can be avoided or minimized?
3. Why is back up protection needed?
4. Define the overshoot time of relay.
5. Write the functions of isolator.
6. What is meant incipient fault?
7. Why the carrier current protection scheme cannot be applied to below 110kV transmission lines?
8. Why reverse power protection is employed for protection of duplicate feeders and ring main system?
9. Give the characteristics of various over current relay.
10. Give the generalised mathematical expression for distance relays.

PART B — (5 × 16 = 80 marks)

11. (a) How will you protect the transmission line against direct lightning strokes? Discuss.

Or

- (b) A 50Hz overhead line has the line to ground capacitance of  $1.2\mu F$ . It is decided to use a ground fault neutralizer. Determine the reactance to neutralize the capacitance of (i) 100% of the length of line. (ii) 95% of the length of line (iii) 80% of the length of line.

12. (a) (i) Explain Slepian's theory of arc interruption and discuss its limitations. (6)

- (ii) A 50 Hz, three phase alternator With grounded neutral has an inductance of 1.6 mH per phase and is connected to the bus-bars through a circuit breaker. The capacitance to earth of the circuit between the alternator and the circuit breaker is  $0.0032\mu F$  per phase. Due to a short on the bus-bars the breakers opens when the rms value of current is 8000 A. Determine the frequency of oscillations, active recovery voltage, time for maximum RRRV and maximum RRRV. (10)

Or

- (b) (i) What are the practical limitations of breaking high voltage direct current circuits? Explain some of the means of overcoming these difficulties. (8)

- (ii) Describe the working principle of vacuum circuit breaker with a neat sketch. (8)

13. (a) (i) Describe the construction and working of a HRC fuse. (8)

- (ii) Mention four important items in a sub-station and explain how are items arranged while designing a sub-station. (8)

Or

- (b) (i) Explain the different types of isolation and earthing switches. (8)

- (ii) What is meant by GIS? Explain. (8)

14. (a) (i) Describe the percentage differential protection employed for alternator. (8)

- (ii) Explain the protection scheme employed for ring main system. (8)

Or

- (b) Explain the principles of

- (i) Distance protection of EHV lines.

- (ii) Carrier current protection. (8 + 8)

15. (a) With neat sketches, explain the operation of reactance, impedance and mho relays. (16)

Or

- (b) Write short notes on:

(i) Under frequency relay.

(ii)  $\mu p$  based distance relay.

(8+8)

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