

Duration – 3 Hours**Total Marks- 80****N.B.:** - (1) Question No.1 is compulsory.(2) **Attempt** any **Three** questions out of the remaining **five** questions.

(3) Assume suitable data if necessary and justify the same.

Q 1. Answer **all** questions.A) Explain the terms short circuit MVA and symmetrical fault. **05**B) Describe the volt time curve as required for insulation coordination studies in power system with an example **05**C) Discuss in brief the significance of tower footing resistance **05**D) Describe the working principle of lightning arrester. Explain any arrester in detail. **05**Q 2 a) Illustrate the short circuit of synchronous machine at no load condition. **10**Q 2 b) Build the Z-bus for the 3 Bus network in which elements are connected as **10**Bus 1-Bus 2: $j0.2$;Bus 1-Bus 2: $j0.4$;Bus 1-Bus3: $j0.35$ Bus 2-Bus 3: $j0.25$. (Assume Bus 3 as a reference bus)Q 3 a) Explain and draw the zero sequence networks for following types of connections of a three phase transformer **10**

i) Delta-Delta

ii) Delta-Star(ungrounded)

iii) Delta-Star(Grounded)

iv) Star(Grounded)- Star(Grounded)

v) Star(ungrounded)- Star(ungrounded)

Q 3 b) Derive the equation for fault current and sequence network for single line to ground fault. State the various assumptions in derivation. **10**

- Q 4 a) A star connected balanced load of 10ohm each has the following voltages **10**
across its terminals $V_{ab}=200V$, $V_{bc}=220V$ and $V_{ca}=180V$. Calculate the
symmetrical components of line and phase voltages. From the symmetrical
components of line voltages determine the line current.
- Q 4 b) Describe the generation of voltage and current travelling waves on a short **10**
circuited line with figure and equations.
- Q 5 a) Explain the principle of lightning phenomenon and protection against **10**
lightning with respect to power system.
- Q 5 b) Discuss the advantages and disadvantages of Corona **10**
- Q 6 a) Describe the Z-bus formulation. **10**
- Q 6 b) Explain the following (i) critical disruptive voltage and visual disruptive **10**
voltage (ii) transient recovery voltage
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