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**.

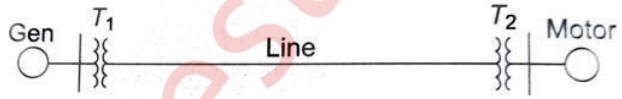
A) Differentiate between Symmetrical and Unsymmetrical Faults. **05**

B) Define Insulation Coordination with volt-time curve. **05**

C) Discuss Lightning Phenomenon with neat labelled diagrams. Define Tower Footing resistance. **05**

D) Why ground wires are provided on top of the Transmission lines ? **05**

Q 2 a) A synchronous generator and synchronous motor each rated at 25 MVA and 11KV having 15 % sub transient reactance are connected through transformer and line as shown. The transformer is rated for 25 MVA 11/66 KV and 66/11 KV with leakage reactance of 10%. The line has reactance of 10% on the base of 25 MVA and 66 KV. The motor is drawing 15 MW at 0.8 pf leading and terminal voltage is 10.6KV .when symmetrical three phase fault occurs at the terminal of motor. Find the sub transient current in generator, motor and fault. **10**



Q 2 b) Derive Fortescue theorem for Symmetrical fault analysis. **10**

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) A three phase 50 MVA, 11 kV generator is subjected to various faults and the currents so obtained in each fault are: 2000 A for a three phase fault; 1800 A for a line-to-line **10**

fault and 2200 A for a line-to-ground fault. Find the sequence impedances of the generator.

Q 4 a) Discuss the operation of synchronous machine on loaded condition with waveform equation and equivalent circuit diagram. **10**

Q 4 b) Derive the equation for fault current for Line to Line Fault. State the various assumptions. Draw the sequence network for same. **10**

Q 5 a) Why Insulation Coordination is required ? Explain the following : 1. Surge Reactor 2. Surge Capacitor 3. Lightning Rod **10**

Q 5 b) Explain construction and working of following: 1. Thyrite type Surge Arrester 2. Metal Oxide Gapless Arrester **10**

Q 6 a) A delta connected balanced resistive load is connected across an unbalanced three phase supply. where the current in line A is 10A at angle (30 degree) and current in line B is 15A at angle (-60degree). Find the symmetrical components of line currents also find the symmetrical components of delta currents. **10**

Q 6 b) Discuss the formation of Corona. State factors affecting the corona. **10**
