

Unit 1 Basic Theory
Part A with answer

1. Define EMI

Electromagnetic interference is the degradation in the performance of a device, or equipment, or a system caused by an electromagnetic disturbance.

2. Define EMC

The ability of a receptor (a device, or equipment, or a system) to function satisfactorily in its electromagnetic environment without at the same time introducing intolerable electromagnetic disturbances to any other device/equipment/system in that environment is called electromagnetic compatibility.

3. What are the three criteria for an electromagnetically compatible system to satisfy?

An electromagnetically compatible system satisfies three criteria are

1. It does not interfere with the operations of other systems.
2. It is immune from the emissions of other systems.
3. It does not interfere with its own operation

4. What are the different EMI Sources in Circuits?

- Local oscillators
- Switches
- Motors
- Filters
- Circuit breakers
- Logic & Digital circuits
- Relays

5. What are the three ways to prevent interference?

There are three ways to prevent interference:

- Suppress the emission at its source.
- Make the coupling path as inefficient as possible.
- Make the receptor less susceptible to the emission.

6. What are the various methods to eliminate EMI?

1. Shielding
2. Grounding
3. Bonding
4. Filtering
5. Isolation
6. Separation and Orientation
7. Cable design

7. How are EMI/EMC classified?

Radiated emissions and susceptibility (RE and RS) Conducted emissions and susceptibility (CE and CS)

8. Write down the mathematical expression for ESD

$$\vec{E}(\vec{r}, t) = \vec{U}_y \frac{dl}{2\pi \epsilon_0 D^2} \frac{p_x}{D^2} \left\{ \frac{3i}{cD^2} + \frac{1}{cD} + \frac{1}{c^2 D} \frac{\partial i}{\partial t} \right\} +$$

$$U_x \frac{dl}{2\pi \epsilon_0} \left\{ \left(\frac{3x^2}{D^2} - 1 \right) \frac{i}{cD^2} + \left(\frac{2x^2}{D^2} - 1 \right) \frac{\partial i}{\partial t} \right\}$$

$$\vec{H}(\vec{r}, t) = U_0 \frac{dl}{2\pi D} \left\{ \frac{i}{D^2} + \frac{1}{cD} \frac{\partial i}{\partial t} \right\}$$

9. What are the different EMI Sources in Circuits?

- Local oscillators
- Switches
- Motors
- Filters
- Relays
- Circuit breakers
- Logic & Digital circuits

10. What are the commonly used site antennas for measurement of RE and RS?

- Rod antenna
- Loop antenna
- Biconical antenna
- Dipole antenna
- Log periodic antenna
- Conical log spiral antenna
- Waveguide horn

11. What are the major elements of electromagnetic?

Source (sometimes referred to as an emitter) produces the emission. It may be a noisy component, or a transmitter

Receptor (sometimes referred to as a victim) is a component or device that receives noise or interference from the source

Coupling path transfers the emission energy to a receptor, where it is processed, resulting in either desired or undesired behavior.

12. List out the mechanism of the electromagnetic interference travel from source to receptor

The various mechanisms in which electromagnetic interference can travel from its source to receptor is direct radiation from source and receptor, Electromagnetic interference radiated by the electrical power, signal, or control cables of the source

13. What is Electro Static Discharge?

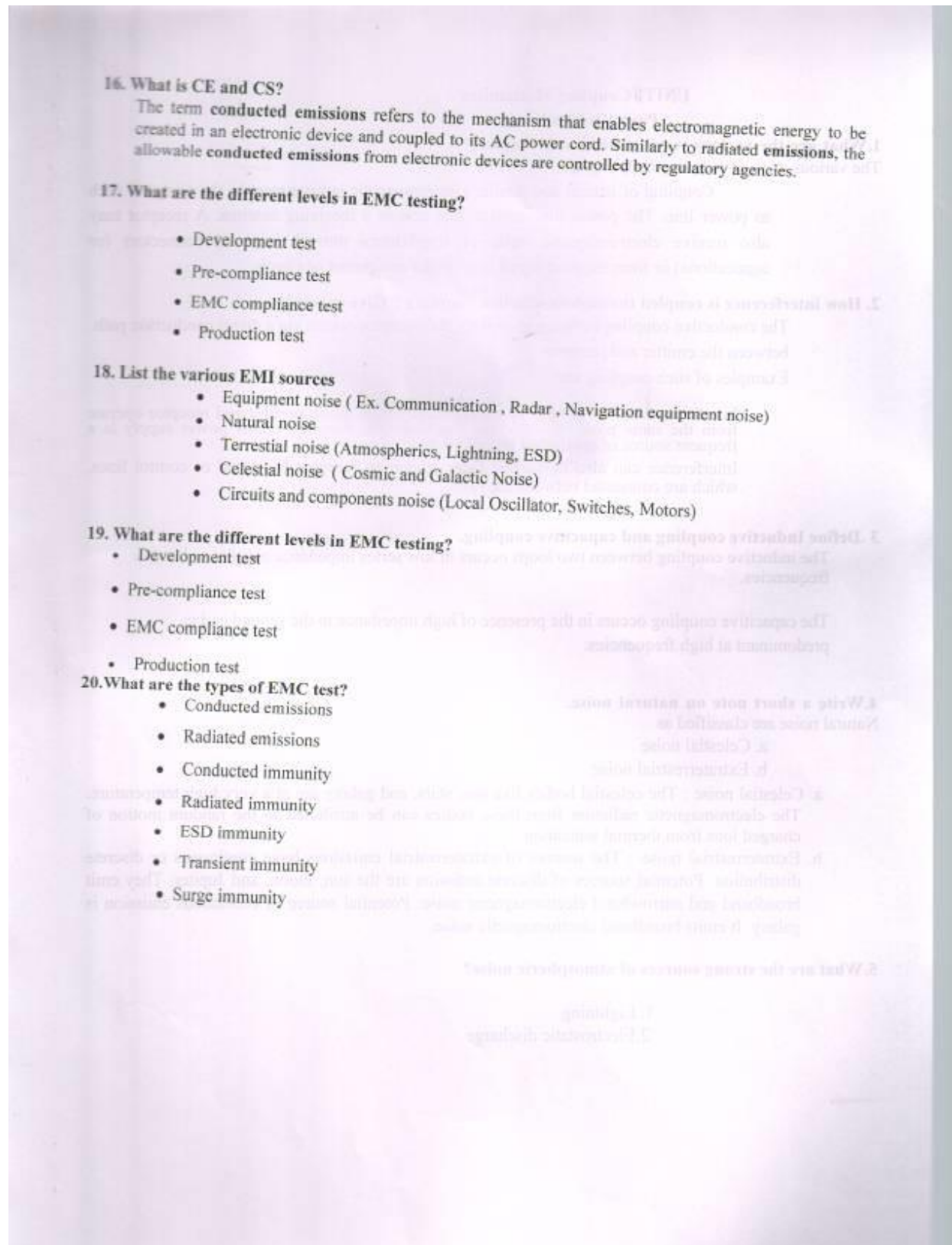
Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown. A buildup of static electricity can be caused by charging or by electrostatic induction.

14. What are the various types of EMI?

Radiated Emission (RE) Conducted Emission (CE) Radiated Susceptibility (RS) Conducted Susceptibility (CS)

15. What is RE and RS?

The term **conducted emissions** refers to the mechanism that enables electromagnetic energy to be created in an electronic device and coupled to its AC power cord. Similarly to radiated emissions, the allowable **conducted emissions** from electronic devices are controlled by regulatory agencies.



Unit I Basic Theory ①

1. Explain the different sources of EMS in detail.

Give example.

* EMS sources

(i) Natural

(ii) Man-made

* Electromagnetic noise

* Extra terrestrial Emission sources

* Atmospheric EM noise

(i) Lightning discharge

(ii) ESD.

2. Explain the features of conducted EMI and radiated EMI.

* Block diagram of radiated EMI

* key features

* Radiated susceptibility

* Conducted emission block diagram

* Example

* Conducted susceptibility.

3. Give an account of radiation hazards.

* Ionizing radiation (Example)

* Non-ionizing " (Examples)

Types of hazards.

- (i) Electrical hazards
- (ii) Fire "
- (iii) Biological "
- (iv) Effects of human body on radiation.

4. Explain about the various issue of EMC.

* Emission

- (i) Radiated emission ← from PCB
from cables

- (ii) Conducted Emission

* Susceptibility → block diagram

* Coupling

- (i) Radiated Coupling

- (ii) Conducted "

- (iii) Inductive "

- (iv) capacitive "

- (v) Magnetic Coupling.

5. Explain about the EMC test categories in detail.

* Emission testing

* Susceptibility "

* Immunity "

* ESD "

* Conducted Immunity test