

## EMT ASSIGNMENT

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SUBJECT: ELECTROMAGNETIC THEORY

REG. NO: RA2311004010387

AND INTERFERENCE

DEPT.: B.TECH (ECE-CORE)

30/30

1. A smartphone is causing interference with nearby Wi-Fi signals, leading to degraded performance of other devices. What design modifications can be implemented to reduce EMI and improve the phone's compatibility with surrounding electronics?

Sol:

To reduce EMI and improve a smartphone's compatibility with surrounding electronics, several design modifications can be implemented.

i) EMI Shielding: Incorporate EMI shielding materials in smartphone's design, such as conductive coatings, metal enclosures or EMI gaskets. This will block unwanted electromagnetic waves from escaping the device.

ii) PCB design optimisation: Optimise the PCB layout to minimize EMI. This includes reducing trace lengths, using differential signalling, and separating high-speed to low speed components.

iii) Filtering components: Adding filtering components like ferrite beads, capacitors and inductors to suppress high-frequency noise & prevent it from damaging devices.

iv) Grounding Techniques: Improve proper grounding techniques to reduce noise & improve signal integrity.

1) Shielded cables & connectors: Use shielded cables and connectors for external connections to prevent EMI from affecting other devices.

2) An electric vehicle is experiencing malfunctions in its electronic control systems due to EMI from the high-power drive systems. What strategies can be employed to improve electromagnetic compatibility within vehicle's electronic components?

Sol:

To improve electromagnetic compatibility (EMC) within an electric vehicle's electronic components, several strategies can be employed:-

(i) Shielding and grounding: Use EMI shielding materials & proper grounding techniques to minimize electromagnetic emissions & protect sensitive components.

(ii) Cable & connector design: Use shielded cables and connectors for high-power connections to reduce EMI. Ensure proper termination & grounding of cables.

(iii) Power Management: Implement efficient power management techniques to reduce electrical noise & improve overall system.

(iv) Component Selection: Choose components with low electromagnetic emissions & high immunity to EMI.

(v) Software Algorithms: Develop software algorithms to ensure, manage such as adjusting the switching frequencies of power converters and implementing noise cancellation techniques.

Also, PCB layout optimisation, filtering components techniques can also be applied.

Interference from satellite communication system faces interference from solar radiation and electromagnetic disturbance in space. What design considerations can be implemented to ensure reliable communication and minimize EMI.

Sol:

To ensure a wireless pacemaker, several methods can be employed:

- (i) Frequency Management: Implement frequency management techniques to avoid interference from high-frequency communication equipment.
- (ii) Robust Communication protocols: Develop robust communication protocols that can ~~to~~ handle interference & ensure reliable data transmission between the pacemaker and external devices.
- (iii) Testing and Certification: Conduct thorough testing and obtain certification for the pacemaker to ensure it meets ~~electromagnetic~~ electromagnetic compatibility standards and can operate reliably in EMI prone environments.
- (iv) Patient education: Educate patients on potential sources of EMI and how to minimize exposure, such as keeping a safe distance from high frequency communication equipment.