SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
S.R.M Nagar, Kattankulathur – 603 203.

Department of Electronics and Communication Engineering

QUESTION BANK

1906805 - ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

Regulation - 2019

Year/Semester/Branch	**:**	**IV/VIII/ECE**
Academic Year	**:**	**2024 - 2025 (Even Semester)**
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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Subject Code & Name : 1906805- Electromagnetic Interference and Compatibility
Year/Semester/Branch : IV / VIII / ECE
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UNIT I - EMI/EMC CONCEPTS				
EMI-EMC definitions; Sources and Victims of EMI; Conducted and Radiated EMI Emission and Susceptibility; Case Histories; Radiation Hazards to humans.				
PART - A				
Q.No.	**Questions**	**Course Outcomes**	**BT Level**	**Competence**
1.	What is the need for electromagnetic compatibility?	CO1	BTL 1	Remembering
2.	Write some of the testing strategies in EMC.	CO1	BTL 1	Remembering
3.	Identify the three criteria to be satisfied by any system to become electromagnetically compatible.	CO1	BTL 1	Remembering
4.	Discuss the steps to prevent emission that causes the EMI in a system.	CO1	BTL 2	Understanding
5.	Why EMI is a vital problem?	CO1	BTL 1	Remembering
6.	We feel electric shock at times, when we touch TV and Computer monitors. Give the reason.	CO1	BTL 2	Understanding
7.	List out types of electromagnetic emission.	CO1	BTL 1	Remembering
8.	Give the explanation about the conducted coupling of EMI.	CO1	BTL 1	Remembering
9.	Why a bike started or a mixie under running condition disturbs a TV receivers functioning.	CO1	BTL 1	Remembering
10.	Where is a decoupling capacitor used? Why?	CO1	BTL 1	Remembering
11.	Illustrate various types of radiation coupling in EMI.	CO1	BTL 2	Understanding
12.	Choose which coupling happens directly between the emitter and receptor.	CO1	BTL 2	Understanding
13.	What is the possibility to develop circuit models of EMI with correct reason?	CO1	BTL 1	Remembering
14.	Assess on the two factors that tend to affect the amount of interference that would otherwise be transmitted along a conducted path.	CO1	BTL 2	Understanding
15.	Define EMI and EMC.	CO1	BTL 1	Remembering
16.	Differentiate conducted and radiated emission.	CO1	BTL 2	Understanding
17.	Classify EMI/EMC.	CO1	BTL 2	Understanding
18.	Summarize the effect of EMI on secured communications.	CO1	BTL 2	Understanding

19.	What would happen if the coupling path is not properly shielded? Justify.	CO1	BTL 2	Understanding
20.	How would you reduce the hazards due to radiation?	CO1	BTL 1	Remembering
21.	What is meant by electromagnetic compatibility?	CO1	BTL 1	Remembering
22.	Infer some of the EMC applications.	CO1	BTL 2	Understanding
23.	Is it possible to develop circuit models of EMI?	CO1	BTL 2	Understanding
24.	Express the different units of parameters for the measurements of EMI.	CO1	BTL 2	Understanding

PART - B						
1.		List out all the sources and victims of EMI with examples?	(13)	CO1	BTL3	Applying
2.		Write the various mechanisms in which electromagnetic interference can travel from its source to the receptor.	(13)	CO1	BTL4	Analyzing
3.		Define an intersystem EMI and explain how it affects equipment in an EM environment.	(13)	CO1	BTL4	Analyzing
4.		Select and write about the case histories related to intersystem EMI.	(13)	CO1	BTL4	Analyzing
5.	(i)	What is an intra-system EMI? How does it affect equipment in an EM environment?	(7)	CO1	BTL3	Applying
	(ii)	Write the case histories related to intersystem EMI.	(6)	CO1	BTL3	Applying
6.	(i)	Distinguish between the features of conducted EMI and radiated EMI.	(7)	CO1	BTL3	Applying
	(ii)	Outline the interference elements present in an EMI system.	(6)	CO1	BTL3	Applying
7.		Summarize in detail about the conducted EMI and radiated EMI with examples.	(13)	CO1	BTL3	Applying
8.		Illustrate the radiation hazards to humans.	(13)	CO1	BTL3	Applying
9.	(i)	Identify how a conducted emission occurs in an EM environment.	(7)	CO1	BTL3	Applying
	(ii)	Explain the tests performed for the conducted susceptibility.	(6)	CO1	BTL3	Applying
10.	(i)	Illustrate proper industrial citations to explain the significance of EMI in a system design.	(7)	CO1	BTL3	Applying
	(ii)	Show how celestial bodies act as a source of EMI.	(6)	CO1	BTL3	Applying
11.	(i)	Select a proper testing methodology for radiation emissions and susceptibility. Explain.	(7)	CO1	BTL3	Applying
	(ii)	Interpret the lightning discharge as a source of EMI and discuss on the strong sources of atmospheric noise.	(6)	CO1	BTL3	Applying
12.	(i)	Write short notes on EMI Testing categories.	(7)	CO1	BTL3	Applying
	(ii)	What are the various parameters of measurement? Give their units.	(6)	CO1	BTL3	Applying
13.		Investigate on details of how an EMI is caused by radiation hazards.	(13)	CO1	BTL4	Analyzing
14.	(i)	Examine the measurement performed for the conducted emission.	(7)	CO1	BTL4	Analyzing
	(ii)	Inspect the role of decoupling capacitors in digital IC's.	(6)	CO1	BTL4	Analyzing
15.		Analyze the various issues of EMC in brief.	(13)	CO1	BTL4	Analyzing

16.		Consider the past historical facts and criticize on the impact of radio communication. Also discuss how lightning discharges affect the transmission line communication.	(13)	CO1	BTL4	Analyzing
17.		Inspect the discrimination between time domain and frequency domain EMI. Why analysis is made in frequency approach analysis, design and location of high voltage equipment?	(13)	CO1	BTL4	Analyzing
PART - C						
1.		Elaborate the various sources of electromagnetic radiation and its hazards.	(15)	CO1	BTL3	Applying
2.		Examine the effect of radiation on the human body.	(15)	CO1	BTL4	Analyzing
3.	(i)	Analyze the mechanisms of EMI. Mention its applications.	(8)	CO1	BTL4	Analyzing
	(ii)	Illustrate the types of EMI with real diagram explain the sources and consequences of EMI.	(7)	CO1	BTL4	Analyzing
4.	(i)	Explain how EMI is different from RFI.	(8)	CO1	BTL4	Analyzing
	(ii)	In what frequency range are, (a) Conducted EMI, (b) Radiated EMI likely to be predominant. Why?	(7)	CO1	BTL4	Analyzing
5.		With neat diagram explain the sources and consequences of EMI and explain on the types of EMI	(15)	CO1	BTL3	Applying

UNIT II - EMI COUPLING PRINCIPLES

Conducted, Radiated and Transient coupling; Common Ground impedance coupling; Common mode and Ground Loop coupling; Differential mode coupling; Near field Cable to Cable Coupling; Field to Cable Coupling; Power Mains and Power Supply coupling; Transient EMI, ESD.

PART - A

Q.No.	Questions	Course Outcomes	BT Level	Competence
1.	List out the types of coupling between cables.	CO2	BTL 1	Remembering
2.	Draw the elements of interference in a basic system with source and receptor.	CO2	BTL 1	Remembering
3.	Show common mode coupling in circuits.	CO2	BTL 1	Remembering
4.	Describe the effect of cross talk with reference to EMI/EMC design issues.	CO2	BTL 2	Understanding
5.	Express the impacts of electromagnetic emission.	CO2	BTL 2	Understanding
6.	Identify the types of fundamental sources of EMI	CO2	BTL 1	Remembering
7.	What would happen if conductive transfer occurs?	CO2	BTL 1	Remembering
8.	Interpret the drawbacks of various coupling mechanisms.	CO2	BTL 2	Understanding
9.	Compare on common mode and differential mode radiated field to cable coupling	CO2	BTL 2	Understanding
10.	Point out the important techniques to control EMI at source point.	CO2	BTL 2	Understanding
11.	Define ground coupled interference.	CO2	BTL 1	Remembering
12.	What is transient coupling and factors that influence grounding scheme?	CO2	BTL 1	Remembering
13.	Give suitable explanation for ground with respect to working on electrical gadgets.	CO2	BTL 2	Understanding

14.	Relate the way in which one can avoid power mains interference.	CO2	BTL 2	Understanding
15.	Classify the factors that the noise voltage developed in a closed loop, depend on.	CO2	BTL 2	Understanding
16.	Interpret the need of ground loop coupling.	CO2	BTL 2	Understanding
17.	Infer about automotive transient.	CO2	BTL 2	Understanding
18.	Distinguish power supply and power main coupling.	CO2	BTL 2	Understanding
19.	Identify the reason for skin effect	CO2	BTL 1	Remembering
20.	Justify how the field coupling affects the system?	CO2	BTL 2	Understanding
21.	What is GLC?	CO2	BTL 1	Remembering
22.	Define ESD.	CO2	BTL 1	Remembering
23.	Draw the differential mode coupling in circuits.	CO2	BTL 1	Remembering
24.	How does one avoid power mains interference?	CO2	BTL 1	Remembering

PART - B						
1.		List out the electromagnetic field sources found in an electromagnetic environment? Explain in details.	(13)	CO2	BTL3	Applying
2.		Define coupling. What are the types of coupling encountered in an EM environment? Discuss about it.	(13)	CO2	BTL3	Applying
3.		What is common mode coupling? Show how it affects a system in an electromagnetic environment.	(13)	CO2	BTL3	Applying
4.		Summarize about the coupling path and what are the electromagnetic interferences that occur in the coupling path?	(13)	CO2	BTL3	Applying
5.	(i)	Can you recall radiated differential mode coupling? What way this is different from the radiated common mode coupling?	(7)	CO2	BTL4	Analyzing
	(ii)	Explain the capacitive coupling that occurs between the two cables running parallel to each other.	(6)	CO2	BTL4	Analyzing
6.	(i)	With neat diagrams and scenarios, describe about the inductive coupling supporting.	(7)	CO2	BTL3	Applying
	(ii)	Discuss in detail about various EMI coupling modes with CM and DM current measurements.	(6)	CO2	BTL3	Applying
7.		Analyze different types of coupling models of EMI in detail.	(13)	CO2	BTL4	Analyzing
8.	(i)	Examine how common mains supply acts as a frequent source of conducted interference.	(7)	CO2	BTL3	Applying
	(ii)	Elaborate the scenario which demonstrates the electromagnetic coupling between an emitter and a receptor. Support it with neat diagrams.	(6)	CO2	BTL3	Applying
9.	(i)	Analyze the effects of inductance in a two wire cable system.	(7)	CO2	BTL4	Analyzing
	(ii)	Describe the effects of the capacitance that exists between the cables.	(6)	CO2	BTL4	Analyzing
10.		Analyze how an electrostatic discharge occur with an example.	(13)	CO2	BTL4	Analyzing
11.	(i)	List out the is causes of ground loop coupling with explanation.	(7)	CO2	BTL3	Applying
	(ii)	Show that how ground loop coupling affects the grounding in a system that is a part of the electromagnetic environment.	(6)	CO2	BTL3	Applying
12.	(i)	Illustrate in detail the conducted and radiated coupling.	(7)	CO2	BTL3	Applying
	(ii)	Describe the common impedance ground couplings with examples.	(6)	CO2	BTL3	Applying

13.	(i)	Outline the transient sources? How does the lightning discharge affect the electronic equipment?	(7)	CO2	BTL4	Analyzing
	(ii)	Discuss in detail about power supply coupling.	(6)	CO2	BTL4	Analyzing
14.	(i)	Explain the cable related emissions and coupling briefly.	(7)	CO2	BTL4	Analyzing
	(ii)	Summarize on automotive transients.	(6)	CO2	BTL4	Analyzing
15.	(i)	Identify how surges occurring on power supply affect the appliances and explain.	(7)	CO2	BTL4	Analyzing
	(ii)	Inspect how the electrostatic discharge affects the digital circuits and control panels.	(6)	CO2	BTL4	Analyzing
16.	(i)	Justify the reasons of how the cable coupling, near and far coupling of EM fields produced can be reduced. Also, suggest the ways to enhance the immunity of circuits/equipment/ systems.	(7)	CO2	BTL4	Analyzing
	(ii)	Analyze the effects of radiative coupling in an EM environment.	(6)	CO2	BTL4	Analyzing
17.	(i)	How an electromagnetic field that appears in the atmosphere does get coupled into the transmission or power cables? Calculate the induced voltage and current due to this coupling action.	(7)	CO2	BTL4	Analyzing
	(ii)	Illustrate the electromagnetic impact of cable coupling in a system design.	(6)	CO2	BTL4	Analyzing
PART - C						
1.		Elaborate the possible modes of coupling in EMC aspects and enumerate the features of the coupling via supply network.	(15)	CO2	BTL3	Applying
2.		Interpret the effects of following coupling mechanisms with respect to practical scenario,		CO2	BTL3	Applying
	(i)	Conducted Coupling,	(5)			
	(ii)	Near field Coupling,	(5)			
	(iii)	Far Field Coupling.	(5)			
3.		Assess the waveforms generated with respect to transient sources and automotive transients.	(15)	CO2	BTL4	Analyzing
4.		Analyze proper distribution functions for the following EMI sources,		CO2	BTL4	Analyzing
	(i)	Tube light,	(5)			
	(ii)	Automobile ignition,	(5)			
	(iii)	Radar transmitter.	(5)			
5.		Give suitable examples for intentional and unintentional electromagnetic emissions during operation of various equipment. How to control them? Also list out electric field intensity levels of various home appliances. Also prove CE is more significant than radiated one.	(15)	CO2	BTL4	Analyzing

UNIT III - EMI CONTROL				
Shielding; EMI Filters; Grounding; Bonding; Isolation transformer; Transient suppressors; EMI Suppression Cables.				
PART - A				
Q.No.	**Questions**	**Course Outcomes**	**BT Level**	**Competence**
1.	What is EMI shielding?	CO3	BTL1	Remembering
2.	Identify the need for shielding.	CO3	BTL1	Remembering
3.	Write Murphy's law?	CO3	BTL1	Remembering
4.	Show the choice of materials for shielding.	CO3	BTL1	Remembering
5.	Define shielding effectiveness.	CO3	BTL1	Remembering
6.	Formulate the shielding effectiveness of E and H-fields.	CO3	BTL2	Understanding
7.	Summarize various shielding methods.	CO3	BTL2	Understanding
8.	Interpret the all the tests that can be carried over in a shielding room.	CO3	BTL2	Understanding
9.	Examine the need for EMI gaskets.	CO3	BTL2	Understanding
10.	Name the different gasketing for EMI sealing.	CO3	BTL1	Remembering
11.	List out the coupling situations to be addressed during the physical layout process.	CO3	BTL1	Remembering
12.	Classify the procedures for effective grounding in PCB design,	CO3	BTL2	Understanding
13.	Write the advantages of multipoint grounding.	CO3	BTL2	Understanding
14.	Chemical salting has to be repeated for every 2 or 3 years for better grounding effect. Justify.	CO3	BTL2	Understanding
15.	Illustrate the terms grounding and bonding, opto-isolator.	CO3	BTL2	Understanding
16.	Categorize EMI filters.	CO3	BTL2	Understanding
17.	Infer about the bulging capacitor.	CO3	BTL1	Remembering
18.	Express the insertion loss of the filter.	CO3	BTL2	Understanding
19.	Infer the functionality of transient suppressors.	CO3	BTL2	Understanding
20.	Draw the diagram of gas tube surge suppressor and arrestors.	CO3	BTL1	Remembering
21.	Show all the procedures that have to be considered for cable routing.	CO3	BTL1	Remembering
22.	Compare conventional and EMI suppression cables.	CO3	BTL2	Understanding
23.	What does transient suppressor mean?	CO3	BTL1	Remembering
24.	Define SEMCAP.	CO3	BTL1	Remembering

PART - B						
1.		Discuss the various types of shielding techniques and derive the expression for the attenuation due to single shield and multimedia laminated shield with neat diagram.	(13)	CO3	BTL3	Applying
2.	(i)	Show that the electromagnetic leakage occurs through shielding joints.	(7)	CO3	BTL3	Applying
	(ii)	Suggest the methods to reduce this electromagnetic leakage.	(6)	CO3	BTL3	Applying
3.	(i)	How can a gasket be used to suppress the EM leakage at joints?	(7)	CO3	BTL3	Applying
	(ii)	Recall on the sealing for EMI leakage.	(6)	CO3	BTL3	Applying

4.		Illustrate in detail about the different types of system grounding for EMI/EMC.	(13)	CO3	BTL3	Applying
5.	(i)	Describe a filter help in suppressing undesired conducted electromagnetic interference?	(7)	CO3	BTL4	Analyzing
	(ii)	Point out your answer with the help of lumped element low pass filter.	(6)	CO3	BTL4	Analyzing
6.	(i)	List out and explain the methods to measure the grounding with examples.	(7)	CO3	BTL3	Applying
	(ii)	Brief out the preventions to be followed while earthling.	(6)	CO3	BTL3	Applying
7.		Analyze the factors considered for a telephone line filter design. How does this factor influence the filter design? Explain with necessary examples.	(13)	CO3	BTL4	Analyzing
8.		Summarize about various lumped element low pass filters for EMI mitigation. Also compare their performances.	(13)	CO3	BTL3	Applying
9.		Write notes on surge protection and suppression, transient protection and suppression, and low frequency magnetic field shielding.	(13)	CO3	BTL3	Applying
10.	(i)	Assess the two filtering methods to control EMI.	(7)	CO3	BTL4	Analyzing
	(ii)	What is an isolation transformer? Briefly describe the function of isolation transformer.	(6)	CO3	BTL4	Analyzing
11.	(i)	Analyze on how the components selection and mounting controls EMI.	(7)	CO3	BTL4	Analyzing
	(ii)	Explain about PCB to chassis ground connection and effects of apertures.	(6)	CO3	BTL4	Analyzing
12.	(i)	What are all the procedures for grounding strategies in the large systems and mixed signal systems?	(7)	CO3	BTL3	Applying
	(ii)	Brief about electromagnetic compatibility that is achieved while PCB is prepared for industry applications.	(6)	CO3	BTL3	Applying
13.	(i)	Illustrate the consequence of different shielding materials over the shielding. Tabulate some of the shielding materials and their uses.	(7)	CO3	BTL4	Analyzing
	(ii)	How does an isolation transformer control EMI?	(6)	CO3	BTL4	Analyzing
14.		What ate the factors influencing the EMI performances of the bonding? How can bonding be made? Mention some guidelines for good bonds.	(13)	CO3	BTL3	Applying
15.		Explain about the EMI suppression cables for EMI control.	(13)	CO3	BTL4	Analyzing
16.		Describe the shielding effectiveness of both solid and non-solid materials including multiple soil shields and thin film shielding.	(13)	CO3	BTL3	Applying
17.		Explain about the various types of non-solid shielding techniques.	(13)	CO3	BTL4	Analyzing
PART - C						
1.		Describe how an opto-isolator and an EMI gasket can control EMI.	(15)	CO3	BTL3	Applying
2.		Assess the grounding strategies for large systems and grounding for mixed signal systems.	(15)	CO3	BTL4	Analyzing
3.	(i)	Elaborate the strategies used for surge protection.	(8)	CO3	BTL3	Applying
	(ii)	Explain the precautions used in earthling.	(7)	CO3	BTL3	Applying

4.		Illustrate different types of filter with neat diagram and also, analyze the insertion loss characteristics.	(15)	CO3	BTL4	Analyzing
5.		For a residential power distribution system, analyze the requirements and the steps to design a safety grounding system considering the two wires and three wires grounding scenario.	(15)	CO3	BTL4	Analyzing

UNIT IV - EMC DESIGN FOR CIRCUITS AND PCBS

Noise from Relays and Switches; Nonlinearities in Circuits; Cross talk in transmission line and Cross talk control; Printed Circuit Board (PCB) Design, System Configuration and Design. Component selection and mounting; PCB trace impedance; Routing; Power distribution decoupling; Zoning; Grounding; VIAs; Terminations.

PART - A

Q.No.	Questions	Course Outcomes	BT Level	Competence
1.	List out the coupling situations to be addressed during the physical layout process.	CO4	BTL1	Remembering
2.	How would you describe the noise from relays and switches?	CO4	BTL2	Understanding
3.	Identify the nonlinearities in circuits.	CO4	BTL1	Remembering
4.	Define PCB trace impedance with respect to EMI.	CO4	BTL1	Remembering
5.	What is zoning?	CO4	BTL1	Remembering
6.	Find the various parameters to be considered in selecting a cable.	CO4	BTL2	Understanding
7.	How to avoid cross talk in PCB design?	CO4	BTL2	Understanding
8.	What is meant by termination in PCB fabrication?	CO4	BTL1	Remembering
9.	How do you understand by routing with reference to PCB design and fabrication?	CO4	BTL2	Understanding
10.	How does cable routing avoid EMI?	CO4	BTL2	Understanding
11.	List some procedures for reducing cross talk.	CO4	BTL1	Remembering
12.	Define the term trace in PCB.	CO4	BTL1	Remembering
13.	Find the use of decoupling capacitors.	CO4	BTL2	Understanding
14.	Why grounding is such an important issue in PCB design?	CO4	BTL2	Understanding
15.	List some procedures for effective grounding in PCB design.	CO4	BTL1	Remembering
16.	What is impedance control in PCBs?	CO4	BTL1	Remembering
17.	How effectively PCBs are designed?	CO4	BTL2	Understanding
18.	List the important consideration of the PCB sizing.	CO4	BTL1	Remembering
19.	Identify the two procedures for component mounting.	CO4	BTL2	Understanding
20.	Point out the relation between radiation and loop area in PCB design.	CO4	BTL2	Understanding
21.	Draw the circuit equivalent of L and C used in PCB design.	CO4	BTL2	Understanding
22.	What is PCB via termination?	CO4	BTL1	Remembering
23.	Define zoning.	CO4	BTL1	Remembering
24.	Infer the need for vias in EMC.	CO4	BTL2	Understanding

PART - B

1.		Describe about the effect of noise from relays and switches for EMC.	(13)	CO4	BTL3	Applying
2.		Discuss about the various factors to be considered for EMC design of PCB.	(13)	CO4	BTL4	Analyzing

3.		Explain in detail about VIAs connection and termination.	(13)	CO4	BTL4	Analyzing
4.	(i)	What is meant by susceptibility level? Explain the relationship between PCB traces and susceptibility level.	(7)	CO4	BTL3	Applying
	(ii)	Discuss briefly on control devices for cross talk.	(6)	CO4	BTL3	Applying
5.		How do you control the impedance value while designing the PCB? Explain.	(13)	CO4	BTL3	Applying
6.		Explain the power distribution decoupling concept.	(13)	CO4	BTL4	Analyzing
7.		Write short notes on the following,	(13)	CO4	BTL3	Applying
	(i)	PCB Motherboard design,	(7)	CO4	BTL3	Applying
	(ii)	Propagation delay.	(6)	CO4	BTL3	Applying
8.	(i)	Discuss how electromagnetic compatibility is achieved while PCB is prepared for industry applications.	(7)	CO4	BTL3	Applying
	(ii)	Why digital circuits are so sensitive in PCBs. Explain.	(6)	CO4	BTL3	Applying
9.		Write short notes on the following,		CO4	BTL3	Applying
	(i)	Zoning in PCB design,	(7)	CO4	BTL3	Applying
	(ii)	Power distribution decoupling.	(6)	CO4	BTL3	Applying
10.		What is cross talk with reference to the design of PCBs and how to minimize it when miniaturization is the concern of today's technology?	(13)	CO4	BTL3	Applying
11.		Explain the importance of PCB design for EMC.	(13)	CO4	BTL4	Analyzing
12.		Write short notes on the termination and various suppression techniques in PCB design.	(13)	CO4	BTL3	Applying
13.	(i)	Discuss how component selection and mounting control EMI.	(7)	CO4	BTL3	Applying
	(ii)	What are all the procedures used for effective grounding in PCB design?	(6)	CO4	BTL3	Applying
14.	(i)	How do motherboard designs and performance models help for better performance?	(7)	CO4	BTL4	Analyzing
	(ii)	Explain in detail the steps involved in motherboard design.	(6)	CO4	BTL4	Analyzing
15.		Elaborate the internal cable routing and connector placement, subsystem placement and decoupling for system configuration and design.	(13)	CO4	BTL3	Applying
16.		Explain various procedures for reducing cross talk.	(13)	CO4	BTL4	Analyzing
17.		Assess the cross talk in transmission line for EMC design.	(13)	CO4	BTL4	Analyzing
PART - C						
1.		Analyze the important aspects of system configuration and its subsystems for the EMC design.	(15)	CO4	BTL4	Analyzing
2.		Examine about the power distribution decoupling for the powering of a properly partitioned PCB from a single power supply.	(15)	CO4	BTL3	Applying
3.		Illustrate interconnection and number of printed circuit boards for the aspect of EMC design.	(15)	CO4	BTL3	Applying
4.		Explain the importance and types of the diagnostic tools that are available to the EMC engineer.	(15)	CO4	BTL4	Analyzing
5.		Inspect and recommend a suitable capacitor of a standard value to offer maximum filtering and also meet the safety requirement of less than 5 mA leakage current when connected between the line and ground of a 230V, 50Hz power supply.	(15)	CO4	BTL4	Analyzing

UNIT V - EMI MEASUREMENTS AND STANDARDS				
Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Line impedance stabilization networks; EMI Rx and spectrum analyser, Civilian standards - CISPR, FCC, IEC, EN; Military standards-MIL461E/462.				
PART - A				
Q.No.	**Questions**	**Course Outcomes**	**BT Level**	**Competence**
1.	Draw two arrangements of OATS.	CO5	BTL 1	Remembering
2.	List the various measurement precautions in OATS.	CO5	BTL 1	Remembering
3.	Why is shielded chamber needed for EMI testing?	CO5	BTL 1	Remembering
4.	What is the need for coupling/decoupling network and show the basic arrangements.	CO5	BTL 1	Remembering
5.	Identify at least two standards for test &measurement procedures published by IEEE/ANSI.	CO5	BTL 1	Remembering
6.	State various types of EM modeling methodologies used in signal integrity analysis.	CO5	BTL 1	Remembering
7.	With LISN illustrate the basic circuit used for RI measurements.	CO5	BTL 1	Remembering
8.	List out the EMI/EMC civilian standards.	CO5	BTL 1	Remembering
9.	Where for MILSTD-461, 462 and 463 are used?	CO5	BTL 1	Remembering
10.	Define IEC and EN.	CO5	BTL 1	Remembering
11.	What are the special requirements of MIL STD 461E for EMC testing?	CO5	BTL 1	Remembering
12.	State the objective of requirements CS103/104/105.	CO5	BTL 1	Remembering
13.	Point out two very important needs for TEM cell.	CO5	BTL2	Understanding
14.	Differentiate military and civilian standards in measurements.	CO5	BTL2	Understanding
15.	Give the reason why CISPR standards evolved.	CO5	BTL2	Understanding
16.	Identify the expansion of the terms CISPR, FCC.	CO5	BTL2	Understanding
17.	Interpret the purpose of EMC standards?	CO5	BTL2	Understanding
18.	Infer the key for conducted emission EMC standards.	CO5	BTL2	Understanding
19.	Express at least two standards for design guidelines and test & measurement procedures published by IEEE/ANSI.	CO5	BTL2	Understanding
20.	Summarize the sources of inaccuracies in the TEM cell measurements.	CO5	BTL2	Understanding
21.	How test bed is selected for ESD testing?	CO5	BTL2	Understanding
22.	Generalize the requirements of military STD for EMC testing.	CO5	BTL2	Understanding
23.	Give some commonly used test antenna and the useful frequency range for each.	CO5	BTL2	Understanding
24.	Compare radiated measurements for class A devices and others.	CO5	BTL2	Understanding

PART - B						
1.		Describe about the open area test site measurements. What are its limitations?	(13)	CO5	BTL3	Applying
2.		Write short notes on,				
	(i)	EMI test shielded chamber,	(7)	CO5	BTL3	Applying

	(ii)	Shielded ferrite lined anechoic chamber.	(6)	CO5	BTL3	Applying
3.		Explain about line impedance stabilization networks.	(13)	CO5	BTL4	Analyzing
4.		Summarize in detail about the configurations of open area test site.	(13)	CO5	BTL4	Analyzing
5.		Analyze the construction of an anechoic chamber used for EMI measurement and explain the procedure for RE and RS measurement.	(13)	CO5	BTL4	Analyzing
6.	(i)	Elaborate the radiation susceptibility test using TEM cell.	(7)	CO5	BTL3	Applying
	(ii)	How do you perform testing using Giga Hertz TEM cell?	(6)	CO5	BTL3	Applying
7.	(i)	Illustrate about the spectrum analyzer with neat sketch.	(7)	CO5	BTL3	Applying
	(ii)	Construct an EMI coupling network and give its need.	(6)	CO5	BTL3	Applying
8.		What does the standard MIL461E emphasize? What are the problems one may face by violating the regulations in it? If possible, a case study be referred to support your justification.	(13)	CO5	BTL3	Applying
9.		Describe the conducted interference controls, radiated interference controls and susceptibility at intermediate levels of exposure in MIL STD 461/462 standard.	(13)	CO5	BTL3	Applying
10.	(i)	Inspect the source of inaccuracies using anechoic chamber measurements.	(7)	CO5	BTL4	Analyzing
	(ii)	Explain the measurements using EMI Rx and spectrum analyzer.	(6)	CO5	BTL4	Analyzing
11.		Infer about EMI specifications and its limits with respect to civilian and military standards.	(13)	CO5	BTL4	Analyzing
12.		Inspect briefly about the measurements using an anechoic chamber.	(13)	CO5	BTL4	Analyzing
13.	(i)	Express the needs to meet for EMI standards? Explain.	(7)	CO5	BTL3	Applying
	(ii)	Discuss in detail the specifications for emission and susceptibility given in MIL461E standard.	(6)	CO5	BTL3	Applying
14.		Distinguish between the FCC's EMC requirement and the European Union's EMC requirements? What additional emission requirements does the European Union have that the FCC does not?	(13)	CO5	BTL3	Applying
15.		Explain about civilian standards FCC, Comite Special des Perturbations Radio electrique (CISPR) and International Electro technical commission (IEC) standards.	(13)	CO5	BTL3	Applying
16.	(i)	List out the IEC specifications adopted by ANSI standard.	(7)	CO5	BTL4	Analyzing
	(ii)	Briefly explain the MIL standards are useful in the area of EMI/EMC.	(6)	CO5	BTL4	Analyzing
17.		Summarize FCC and CISPR Conducted Emission (CE) and Radiated Emission (RE) standards.	(13)	CO5	BTL4	Analyzing
PART - C						
1.		Illustrate in detail about the various MIL STD test methods and civilian STD test methods.	(15)	CO5	BTL3	Applying
2.		Enumerate the construction of an EMI test receiver. Explain the key features used to design EMI test receiver.	(15)	CO5	BTL3	Applying
3.		With neat diagram explain the super heterodyne spectrum analyzer. Also, create the output waveform with illustrations.	(15)	CO5	BTL4	Analyzing
4.		Inspect the hierarchy of standards with the needs and explain on the standards followed in different countries.	(15)	CO5	BTL4	Analyzing
5.		Assess the detail on the CISPR international standardizing organization and its CE and RE standards.	(15)	CO5	BTL4	Analyzing