

(3 Hours)

Max. Marks: 80

- N.B.:** (1) Question No. 1 is compulsory.
 (2) Solve any three questions from the remaining five questions.
 (3) Figures to the right indicate full marks.
 (4) Assume suitable data if necessary and mention the same in answer sheet.

Q 1 Attempt any four questions

- a) Give the characteristics of mixers. [05]
 b) Find order N for designing a maximally flat low-pass filter using insertion loss method for cut-off frequency of 2 GHz, impedance of 50 Ω , and at least 15 dB insertion loss at 3 GHz. [05]
 c) What are the stability criteria in microwave amplifier design? [05]
 d) List the natural and nuclear sources of EMI. [05]
 e) Compare CISPR and FCC standards. [05]
- Q 2** a) Design a low-pass composite filter with cut-off frequency of 2 MHz and impedance of 75 Ω . Place the infinite attenuation pole at 2.05 MHz. [10]
 b) Define various power gains of an amplifier: i) Operating power gain [10]
 ii) Available power gain and iii) Transducer power gain. Derive the expressions for them.
- Q 3** a) Explain the various shielding techniques in EMC with diagram. [10]
 b) Compare various types of Balanced mixers and Image reject mixers. [10]
- Q 4** a) Determine which of the following devices are unconditionally stable. Also determine which device has the greatest stability. [10]

Device	S_{11}	S_{12}	S_{21}	S_{22}
A	$0.75 \angle -60^\circ$	$0.2 \angle 70^\circ$	$5.0 \angle 90^\circ$	$0.51 \angle 60^\circ$
B	$0.34 \angle -170^\circ$	$0.06 \angle 70^\circ$	$4.3 \angle 80^\circ$	$0.45 \angle -25^\circ$

- b) What is phase noise in oscillators? Give a mathematical analysis of phase noise. [10]
- Q 5** a) Design a maximum gain amplifier using open circuit shunt stub at 5 GHz with a GaAs MESFET with the following scattering parameters ($Z_0 = 50\Omega$). [10]

$f(\text{GHz})$	S_{11}	S_{12}	S_{21}	S_{22}
3.0	$0.80 \angle -89^\circ$	$0.03 \angle 56^\circ$	$2.86 \angle 99^\circ$	$0.76 \angle -41^\circ$
4.0	$0.72 \angle -116^\circ$	$0.03 \angle 57^\circ$	$2.60 \angle 76^\circ$	$0.73 \angle -54^\circ$
5.0	$0.66 \angle -142^\circ$	$0.03 \angle 62^\circ$	$2.39 \angle 54^\circ$	$0.72 \angle -68^\circ$

- b) Explain various coupling modes in EMI. [10]

Q 6 Solve Any Four

- a) Write a short note on Grounding schemes in EMC. [05]
 b) Why is the stability parameter μ required in amplifier design although Δ and K parameters are there? [05]
 c) Compare various filter design methods. [05]
 d) What is Richard's Transformation? [05]
 e) Give the characteristics of power amplifiers. [05]
