

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks [20]
1	In RF receiver application the preamplifier has
Option A	Maximum gain amplifier
Option B	Low noise amplifier
Option C	Specific gain amplifier
Option D	Class A power amplifier
2	To design a maximally flat low pass filter with $f_c = 2$ GHz, impedance of $50 \Omega$ and atleast 15 dB IL at 3 GHz the order N is
Option A	2
Option B	3
Option C	5
Option D	6
3	----- is a technique a technique that reduces or prevents coupling of undesired radiated electromagnetic energy into equipment to enable it to operator compatibility in its electromagnetic environment.
Option A	Filtering
Option B	Grounding
Option C	Shielding
Option D	Bonding
4	Direct digital frequency synthesis is obtained by solving digital recursion relationship using a general purpose computer or-----.
Option A	Direct frequency synthesis
Option B	A PLL-DDFS combination
Option C	Multiple loop indirect synthesis
Option D	Sorting sine waves in look up table
5	Inductor is replaced with ----- and capacitor is replaced with ----- of $\lambda/8$ line in Richard's transformation.
Option A	Short stub and open stub
Option B	Shunt capacitor and series inductor
Option C	Shunt inductor and series capacitor
Option D	Series Capacitor and series inductor
6	How instability can be created in oscillator design ?
Option A	Using capacitor in feedback
Option B	Using positive feedback
Option C	Using negative feedback
Option D	Using feed forward feedback
7	----- is not a EMC standard ,
Option A	CJNU FM
Option B	CISPR

Option C	MIL- STD 461 D
Option D	VDE
8	The maximum unilateral gain is a function of -----.
Option A	Source reflection coefficient
Option B	S parameters of transistors
Option C	Load reflection coefficient
Option D	Source and load reflection coefficients
9	Select one which is not a method of frequency synthesis,
Option A	Frequency synthesis by modulus divider
Option B	Direct frequency synthesis
Option C	Compressed frequency synthesis
Option D	Frequency synthesis by PLL
10	Is it possible to use normal smith chart for reading input impedance for reflection coefficient greater than one
Option A	Only possible for certain values of reflection coefficient
Option B	Possible
Option C	Not possible
Option D	Possible if magnitude of reflection coefficient is less than 5

✓ Q.2	
A	Solve any two <span style="float: right;">5 marks each</span>
i	Draw one port oscillator circuit. Find value of $R_L$ which maximizes oscillator power .
ii	Draw two port amplifier . Define various gains with equations.
iii	Describe single balanced mixer using $90^\circ$ hybrid coupler with neat diagram.
B	Solve any one <span style="float: right;">10 marks each</span>
i	<p>A GaAs FET has the following scattering and noise parameters at 4 Ghz measured with <math>50 \Omega</math> system</p> <p><math>S_{11} = 0.6 \angle -60^\circ</math>, <math>S_{12} = 0.05 \angle -26^\circ</math>, <math>S_{21} = 1.9 \angle 81^\circ</math>, <math>S_{22} = 0.5 \angle -60^\circ</math>, <math>F_{min} = 1.6 \text{ dB}</math>, <math>R_n = 20 \Omega</math> and <math>\Gamma_{opt} = 0.62 \angle 100^\circ</math></p> <p>Assuming the FET to be unilateral .design an amplifier for maximum possible gain and noise figure not more than 2dB.</p>
ii	Design a composite low pass filter by image parameter method for following specifications $R_o = 50 \Omega$ $f_c = 50 \text{ MHz}$ . $f_\infty = 52 \text{ MHz}$

Q3	
A	Solve any two <span style="float: right;">5 marks each</span>
i	Compare design difference in amplifier and oscillator.
ii	Explain the characteristics of power amplifier,
iii	Explain the terms insertion loss, shape factor, quality factor, rejection in filter.
B	Solve any one <span style="float: right;">10 marks each</span>
i	Design a two port transistor oscillator at 6 GHz using FET in common source configuration driving 50 $\Omega$ load on drain side $S_{11} = 0.9 \angle -150^\circ$ , $S_{12} = 0.2 \angle -15^\circ$ , $S_{21} = 2.6 \angle 50^\circ$ , $S_{22} = 0.5 \angle -105^\circ$ . Calculate and plot stability circles and choose $\Gamma_{in}$ for $\Gamma_{in} \gg 1$ . Design load terminating network
ii	An N=3 Chebyshev bandpass filter is to be designed with 3 dB passband ripple for a communication link. The centre frequency is at 2.4 GHz and filter has to meet bandwidth requirement of 20%. The filter has to be inserted into 50 $\Omega$ characteristic line impedance

Q4	
A	Solve any two <span style="float: right;">5 marks each</span>
i	What are the sources of EMI and effects of EMI,
ii	Explain differential FET mixer with diagram.
iii	Write a note on safety grounding.
B	Solve any one <span style="float: right;">10 marks each</span>
i	S parameters of properly biased HFET-1101 measured using 50 $\Omega$ network analyzer at 6 GHz $S_{11} = 0.614 \angle -167.4^\circ$ , $S_{12} = 0.046 \angle 65^\circ$ , $S_{21} = 2.18 \angle 32.4^\circ$ , $S_{22} = 0.716 \angle -83^\circ$ Design an amplifier using this for maximum possible gain
ii	A one port oscillator uses a negative resistance diode having $\Gamma_{in} = 1.25 \angle 40^\circ$ , $Z_o = 50 \Omega$ at its desired operating point for $f = 6$ GHz. Design load matching network.