(3 Hours) **Max Marks: 80**

Note:
1. **Question No. 1 is compulsory.**
2. **Out of remaining questions, attempt any three questions.**
3. **Assume suitable additional data if required.**
4. **Figures in brackets on the right hand side indicate full marks.**

1. (A) State Central limit theorem and give its significance (05)
   (B) State the three axioms of probability. (05)
   (C) State and explain Bayes Theorem. (05)
   (D) Define Power spectral density and prove any two properties. (05)
2. (A) Prove that if input to LTI system is w.s.s. then the output is also w.s.s. (10)
   (B) In a factory, four machines A_1, A_2, A_3 and A_4 produce 35%, 10%, 25% and 30% of the items respectively. The percentage of defective items produced by them is 3%, 5%, 4% and 2%, respectively. An item is selected at random. (10)
   (i) What is the probability that the selected item will be defective?
   (ii) Given that the item is defective what is the probability that it was produced by machine A_4?
3. The joint probability density function of two random variables is given by (20)
   $f_{x,y}(x,y) = 15e^{-3x-3y} : x \geq 0, y \geq 0$
   i) Find the probability that $x<2$ and $y>0.2$.
   ii) Find the marginal densities of x and y.
   iii) Are x and y independent?
   iv) Find $E(x/y)$ and $E(y/x)$.
4. (A) A stationary process is given by $X(t) = 10 \cos [100 t + \theta]$ where θ is a random variable with uniform probability distribution in the interval $[-\prod, \prod]$. Show that it is a wide sense stationary process. (10)
   (B) Explain Strong and weak law of large numbers. (05)
   (C) Write short notes on the following special distributions. (05)
   i) Uniform distribution.
   ii) Gaussian distribution.
5. (A) Define discrete and continuous random variables by giving examples. Discuss the properties of distribution function. (10)
   (B) A random variable has the following exponential probability density function: $f(x) = Ke^{-|x|}$. Determine the value of K and the corresponding distribution function. (10)
6. (A) Suppose X and Y are two random variables. Define covariance and correlation of X and Y. When do we say that X and Y are (10)
   (i) Orthogonal,
   (ii) Independent, and
   (iii) Uncorrelated?
   Are uncorrelated variables independent?
   (B) State and prove Chapman-Kolmogorov equation. (10)

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Q.P. Code : 37932

[Time: Three Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B: 1. Question.No.1 is compulsory.
2. Answer any three questions out of remaining five.
3. Assume suitable data wherever necessary.

Q.1		Attempt any four:	**20**
	a.	Explain function of T0 and T1 pins of 8051.	
	b.	Explain PSW of 8051 in detail.	
	c.	Explain Memory organization in 8051 microcontroller.	
	d.	Explain the concept of pipeline of ARM 7.	
	e.	Compare AJMP, SJMP and LJMP instruction of 8051.	
Q.2	a.	Explain interrupts in 8051 microcontroller.	**10**
	b.	Explain PORT 3 structure of 8051.	**10**
Q.3	a.	Explain interfacing of ADC 0808 with 8051.	**10**
	b.	List and explain the different core extension used with ARM processor.	**10**
Q.4	a.	Design 8051 based system with following specifications i) 8051 working at 10MHz. ii) 4 KB External Program memory using 2 KB chips iii) 8 KB External Data memory using 4 KB chips	**10**
	b.	Explain addressing modes of ARM with examples.	**10**
Q.5	a.	Explain stack operation in 8051 with examples.	**10**
	b.	Explain IR based wireless communication system.	**10**
Q.6			**20**
	a.	Explain current program status registers of ARM7	
	b.	Explain serial communication in 8051	
	c.	Explain “Digital camera as an embedded system”	
	d.	What are the challenges in optimizing embedded system design matrices?	

QP CODE : 22616

(3 Hours) **Marks : 80**

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

Q1 (a) Explain the Hazards of Electromagnetic Radiation. 20

(b) Explain the radiation mechanism of antenna with single wire system.

(c) Explain the use of Richard transformation and Kurodas Identity in RF filter design

(d) Derive an expression for array of two isotropic sources with same amplitude and in phase.

Q2 (a) Explain the RF behavior of resistor, capacitor and inductor. 10

(b) Discuss the design procedure for filter using image parameter method. 10

Q3 (a) Design a maximally flat LPF with a cut off frequency of 2 GHz. The generator and load impedance is 50 Ω with 15 dB insertion loss at 3GHz with discrete LC components. 10

(b) Derive an expression for array factor of N element linear array, where all elements are equally fed and spaced. Also find the expression for the position of principle maxima, nulls and secondary maxima. 10

Q4 (a) A radio link has 15 watt transmitter connected to an antenna of 2.5 m^2effective aperture at 5 GHz. The receiving antenna has an effective aperture of 0.5 m^2 and is located at a15 km line of sight distance from transmitting antenna. Assume lossless antennas. Find power delivered to the receiver. 10

(b) Derive an expression for E field and H field of infinitesimal dipole antenna 10

Q5 (a) What is folded dipole Antenna? Draw its typical structure and explain working mechanism. Give its advantages. 10

(b) What is Dolph- Chebyshev array? Explain the steps involved in design of Dolph-Chebyshev array. 10

Q6. **Write short notes** 20
(a) Ground effects on Antenna
(b) Log periodic Antenna
(c) Loop antenna
(d) Horn antenna

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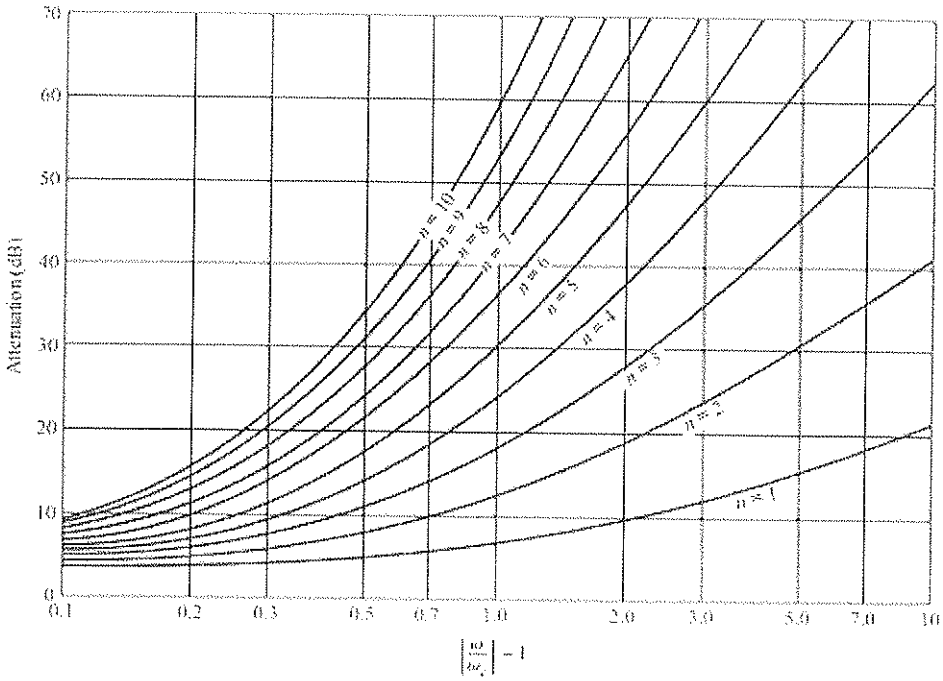

Attenuation versus normalized frequency for maximally flat filter prototypes.

Adapted from G. L. Matthaei, L. Young, and E. M. T. Jones, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*, Artech House, Dedham, Mass., 1980, with permission.

Element Values for Maximally Flat Low-Pass Filter Prototypes ($g_0 = 1$, $\omega_c = 1$, $N = 1$ to 10)

N	$g1$	$g2$	$g3$	$g4$	$g5$	$g6$	$g7$	$g8$	$g9$	$g10$	$g11$
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Source: Reprinted from G. L. Matthaei, L. Young, and E. M. T. Jones, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures*, Artech House, Dedham, Mass., 1980, with permission.

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Duration :3hrs **Max.Marks:80**

N.B. (1) Question No. 1 is compulsory.

(2)Attempt any three questions out of remaining five.

(3)Figures to the right indicate full marks.

(4)Assume suitable data if required and mention the same in answer sheet

1. Solve any four **20**

(a) Explain practical diode detector.

(b) Define sensitivity, image frequency rejection and fidelity for radio receiver.

(c) What is quantization? Explain types of quantization.

(d) Why IF is selected as 455 KHz in AM?

(e) List the applications of pulse communication.

2. (a) Explain concept of AM Wave with related equations and waveforms. **10**

(b) Draw the block diagram of phase cancellation SSB generator and explain how carrier and unwanted sidebands are suppressed? **10**

3. (a) Explain the operation of Foster seeley discriminator with the help of circuit diagram and phasor diagram. **10**

(b) Explain the principle and generation of indirect method of FM generation. **10**

4. (a) What are the drawbacks of delta modulation? Explain the method to overcome these drawbacks. **10**

(b) With the help of suitable waveforms explain generation and detection of PPM. **10**

5. (a) Explain Super heterodyne radio receiver in detail with block diagram. **10**

(b) Explain VSB Transmission in detail with its application. **10**

6. Write short note on(any four) **20**

(a) Compare FM and PM

(b) FM noise triangle

(c) Noise figure and noise factor

(d) Frequency division Multiplexing (FDM)

(e) Pre emphasis and de-emphasis circuits

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Q. P. Code: 50726

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. 1 is compulsory.
(2) Solve any three questions from the remaining five.
(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 4 questions:	
	(A)	Draw a neat circuit of half wave precision rectifier. Draw its input and output waveforms.	[05]
	(B)	Draw a neat circuit with all the component values of mono-stable multivibrator for timer application using IC 555 to obtain a pulse width of 1.1 ms. Take timing capacitor of value 1 µf.	[05]
	(C)	Draw a neat circuit of Current to Voltage converter. Give its output expression.	[05]
	(D)	Draw the functional block diagram of IC 723.	[05]
	(E)	Draw the internal structure of IC 7490 decade counter. Draw its timing diagram.	[05]
Q.2	(A)	Draw a neat circuit diagram of *RC* phase shift oscillator using op-amp. Derive its frequency of oscillation. What are the values of *R* and *C* if its frequency of oscillation is 1 kHz?	[10]
	(B)	Draw a mod-10 counter using IC 7493. Draw its timing diagram.	[10]
Q.3	(A)	With the help of a neat diagram and voltage transfer characteristics explain the working of inverting Schmitt trigger. Derive the expressions for its threshold levels.	[10]
	(B)	Design a voltage regulator using IC 723 to give V_o = 4 V to 32 V and output current of 2 A.	[10]
Q.4	(A)	Draw the circuit diagram of a square and triangular waveform generator using op-amps and explain its working with the help of waveforms. For variation in duty cycle what is the modification needed in the circuit.	[10]
	(B)	Design a second order Butterworth high pass filter for cut off frequency of 1 kHz and pass-band gain of AF=2.	[10]
Q.5	(A)	What is an instrumentation amplifier? Draw a neat circuit of an instrumentation amplifier using 3 op-amps. Derive its output voltage equation.	[10]
	(B)	With the help of a functional block diagram explain the working of voltage regulator LM317 to give an output voltage variable from 5 V to 10 V to handle maximum load current of 500 mA.	[10]
Q.6		Write short notes on: (Attempt any two)	
	(A)	Various parameters of op-amp.	[10]
	(B)	IC 74181 Arithmetic Logic Unit.	[10]
	(C)	Power amplifier LM380.	[10]

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