Dt. 05/6/17 (05)

T.E. Sem V – (CBSGS) EXTC

Q.P. Code : 588101

(3 Hours) **[Total 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) Classify and explain the various types of noise affecting communication.
   (b) AM is a wastage of power and bandwidth, justify the statement.
   (c) Compare between FM and PM.
   (d) Explain Pre-emphasis and De-emphasis.
   (e) What is companding.

2. (a) A modulating signal 20 sin ($2\pi \times 1000\ t$) is used to modulate a carrier signal 80 sin ($2\pi \times 10000\ t$). Find the percentage modulation, frequencies of the sideband components and their amplitudes. What is the BW of the modulated signal? Also draw the spectrum of the AM wave. **10**
   (b) Explain with neat block diagram **any one** method for suppression of unwanted sideband. **10**

3. (a) What are different methods of FM generation? Sketch the circuit and explain the principle of reactance modulator? **10**
   (b) State and prove sampling theorem for band limited signal. What is aliasing effect? **10**

4. (a) Explain with neat block diagram working of Adaptive delta modulator. What are the drawbacks of delta modulator? **10**
   (b) What is signal multiplexing? Explain FDM in detail. **10**

5. (a) Explain with neat block diagram and waveform of AM Super- heterodyne radio receiver. **10**
   (b) Explain operation of Foster Seeley discriminator with the help of circuit and phasor diagram. **10**

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6. Write short notes on **any four** :- 20

(a) Vestigial Side Band (VSB) transmission.

(b) Practical diode detector with delayed AGC.

(c) Generation and detection of PPM.

(d) Amplitude limiting and thresholding in FM.

(e) Quadrature amplitude modulation.

T-E Sem-V EXTC (CBSGS) 07 : 9/6/17 (04)

Q. P. Code : 588201

Time: 3Hours **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 required and mention the same in the answer sheet.

1. Solve **any five :-** 20
   (a) Compare the inverting & non inverting configurations of operational amplifiers.
   (b) Draw the diagram for a grounded load voltage to current converter and derive the expression for the output current.
   (c) Design a first order non-inverting high pass filter to provide a cut-off frequency of 5 kHz.
   (d) Explain the functional block diagram of Timer IC 555.
   (e) Draw the waveforms for the outputs of IC 7490 with respect to the clock and hence explain its working as a decade counter.
   (f) Explain simple current limit protection in voltage regulators.

2. (a) Draw a neat circuit diagram of an instrumentation amplifier using three op amps. Derive the expression for its gain. How can its gain be varied? What are its advantages over a difference amplifier using single op amp? 10
   (b) With the help of a neat diagram explain the working of an R C phase shift oscillator using op amp. Derive the expression for its frequency of oscillation. What are the values of R & C if the frequency of oscillation is 5 kHz? 10

3. (a) With the help of a neat diagram, input and output waveforms and voltage transfer characteristics explain the working of an inverting Schmitt trigger. Derive the expressions for the upper & lower threshold levels. Explain how these levels can be varied. 10
   (b) With the help of a neat diagram and waveforms at appropriate points in the circuit explain the working of a square and triangular waveform generator using op amps. Explain how the duty cycle of the square and triangular waveforms can be varied. 10

4. (a) Draw the functional block diagram of IC 723 voltage regulator and explain its working as a basic low voltage regulator. Design the same for an output of 5 V and load current upto 200 mA. 10
   (b) With the help of a neat functional block diagram explain the working of IC LT 1070 Monolithic Switching regulator. 10

5. (a) Draw the diagram of a monostable multivibrator using timer IC 555. With the help of waveforms at the trigger input, across the charging capacitor and at the output explain its working. Design the same for a pulse width of 11 ms. 10
   (b) With the help of neat circuit diagrams explain the working of a universal shift register IC 74194 as a ring counter and twisted ring counter. 10

6. Write short notes on **any four** 20
   (a) IC 74181 Arithmetic Logic Unit
   (b) IC 74169 4-bit up/down binary counter
   (c) IC 74164 serial input parallel output shift register
   (d) IC XR2206 waveform generator
   (e) IC 534 multiplier

FE. Sem-V EXTC (CBGS)

Random Signal Analysis

(04)

Q.P. Code : 587801

(03 Hrs.) **Total Marks: 80**

N.B.:

1) **Question Number 1 is Compulsory**
2) Attempt any **Three** questions from the remaining **Five** questions
3) Assumptions made should be clearly stated.
4) Use of normal table is permitted

1	**Answer the following**	
a)	For an LTI system with stochastic input prove that autocorrelation of output is given by convolution of cross-correlation (between input-output) and LTI system impulse response.	05
b)	Suppose that a pair of fair dice are tossed and let the RV X denote the sum of the points. Obtain probability mass function and cumulative distribution function for X.	05
c)	If $Z = X + Y$ and if X and Y are independent then derive pdf of Z as convolution of pdf of X and Y.	05
d)	Write a note on the Markov chains.	05
2a)	Define and Explain moment generating function in detail.	05
b)	Let $Z = X/Y$. Determine $f_Z(z)$	05
c)	The joint cdf of a bivariate r.v. (X, Y) is given by $F_{XY}(x,y) = (1-e^{-\alpha x})(1-e^{-\beta y}), x \geq 0, y \geq 0, \alpha, \beta > 0$ $= 0$ otherwise.	
	i) Find the marginal cdf's of X & Y.	02
	ii) Show that X & Y are independent.	02
	iii) Find $P(X \leq 1, Y \leq 1)$, $P(X \leq 1)$, $P(Y > 1)$ & $P(X > x, Y > y)$	06
3a)	Explain strong law of large numbers and weak law of large numbers.	05
b)	Write a note on birth and death queuing models.	05
c)	A distribution with unknown mean μ has variance equal to 1.5. Use central limit theorem to find how large a sample should be taken from the distribution in order that the probability will be at least 0.90 that the sample mean will be within 0.5 of the population mean.	10
4a)	State and prove Chapman-Kolmogorov equation.	05
b)	State and prove Bayes theorem.	05
c)	(i) State any three properties of power spectral density.	03
	(ii) If the spectral density of a WSS process is given by $S(w) = b(a-\lvert w \rvert)/a, \quad \lvert w \rvert \leq a$ $= 0 \quad , \quad \lvert w \rvert > a$ Find the autocorrelation function of the process.	07
5a)	The joint probability function of two discrete r.v.'s X and Y is given by $f(x, y) = c(2x + y)$, where x and y can assume all integers such that $0 \leq x \leq 2$, $0 \leq y \leq 3$ and $f(x, y) = 0$ otherwise. Find $E(X)$, $E(Y)$, $E(XY)$, $E(X^2)$, $E(Y^2)$, var(X), var(Y), cov(X, Y), and ρ.	10

[Turn Over

b) Prove that if input LTI system is WSS the output is also WSS. What is ergodic process? 10

6a) The transition probability matrix of Markov Chain is 05

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{4} & 0 & \frac{3}{4} \\ \frac{3}{4} & \frac{1}{4} & 0 \end{bmatrix} \end{array}$$

Find the limiting probabilities.

b) An information source generates symbols at random from a four letter alphabet $\{a, b, c, d\}$ with probabilities $P(a) = 1/2$, $P(b) = \frac{1}{4}$ and $P(c) = P(d) = 1/8$. A coding scheme encodes these symbols into binary codes as follows: 05

a	0
b	10
c	110
d	111

Let X be the random variable denoting the length of the code, ie, the number of binary symbols.

i) What is the range of X?

ii) Sketch the cdf $F_X(x)$ of X, and specify the type of X.

iii) Find $P(X \leq 1)$, $P(1 < X \leq 2)$, $P(X > 1)$ & $P(1 \leq X \leq 2)$.

c) Write notes on the following: 10

i) Block diagram and explanation of single & multiple server queuing system

ii) M/M/1/∞ queuing system

END

Dt: 29/5/17

T.E Sem-V – EXTC (CBSGS)

Q.P. Code : 588001

(65)

(3 Hours)

[Total Marks 80]

N.B. 1) Question No.1 is Compulsory.
2) Solve any three questions from the remaining.
3) Assume suitable data wherever necessary and justify the assumption.
4) Draw suitable diagrams wherever required.

1. a) Compare Binomal filter and chebyshev filter. 5
   b) What is reactive near field. Explain its importance in communication and its applications. 5
   c) Compare Broadside and Endfire array. 5
   d) Find the gain of an antenna when physical aperture is 5 m^2 at 2 GHz with efficiency 70%. 5

2. a) Design a composit high pass filter by image parameter method with the following specification. 10
   $R_o = 75\ \Omega$, $f_c = 50$ MHz, $f_\infty = 48$ MHz.
   b) Design a LPF whose input and output ports are matched to 50Ω impedance with cut off frequency of 3 GHz, equi ripple of 0.5 dB and rejection of atleast 40 dB at approx twice the cut off frequency. 10

3. a) Derive friss transmission formula state its significance in wireless communicaiton. What is maximum power received at a distance of 0.75 km over free space for 1GHz frequency. The system consist of transmitting antenna with 3dB gain and receiving antenna with 17dB gain and antenna is fed with 200 W power. 10
   b) Derive radiation resistance of small dipole. Explain its significance. 10

4. a) Find the radiation pattern for an array of 4 elements fed with same amplitude and opposite phase. Find its HPBW and BWFN. 10
   b) Draw the structure of microstrip antenna. Discuss its characteristics, limitations and applications. 10

5. a) Describe parabolic reflector antenna and its different feeding methods. 10
   b) Explain important features of loop antenna. Discuss use of loop antenna in radio direction finding. 10

6. **Write short notes on :** 20
   a) RF field effect transistor
   b) Binomial array
   c) RF behavior of resistor and capacitor
   d) Helical antenna

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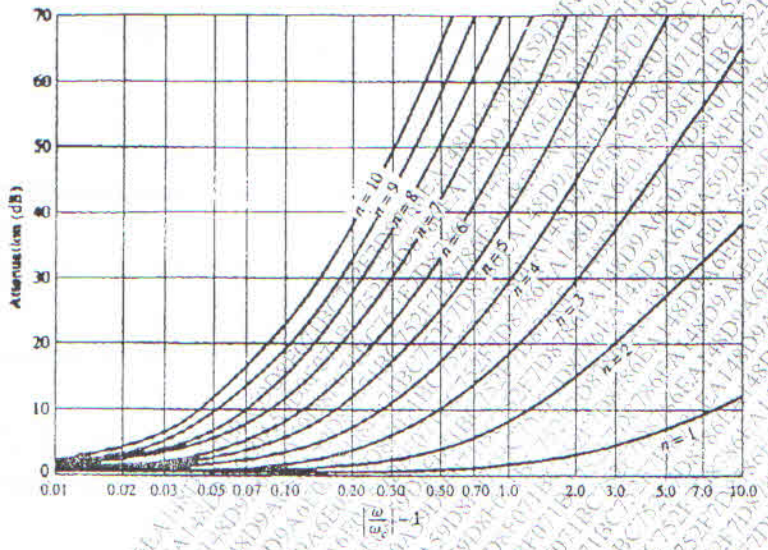
Q.P. Code : 588001



Attenuation versus normalized frequency for equal-ripper filter prototypes. (a) 0.5 dB ripple level.