TE | EXTC | V CBSGS · 18/5/2012
RSA

SA 1st half 171

Con. 3769-12.

GN-7016

(3 Hours) [Total Marks : 100

Note:

1. Question No. 1 is **compulsory.**
2. Attempt **any four** questions out of remaining **six** questions.
3. Illustrate answers with **sketches** wherever **required.**
4. Assume suitable data wherever necessary.

Q1 (a) If A and B are any two events, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ [05]

(b) Explain the concept of conditional probability with an example. [05]

(c) State and prove Baye's Theorem and Total Probability Theorem. [10]

Q2 (a) Define discrete and continuous random variables, give one example of each type. Define expectation of discrete random variable and continuous random variable. [10]

(b) Suppose two million lottery tickets are issued with 100 winning tickets among them.

(i) If a person purchases 100 tickets, what is the probability of winning?

(ii) How many tickets should one buy to be 95% confident of having a winning ticket? [10]

Q3 (a) Find the characteristics function of Poisson distribution and find it's mean and variance. [10]

(b) Let X be a random variable with CDF $F_X(x)$ and PDF $f_X(x)$. Let $y=aX + b$ where a and b are real constants and $a \neq 0$. Find PDF of y in terms of $F_X(x)$. [10]

Q4 (a) Suppose that X and Y are continues random variables with Joint Probability Density function [10]

$$f_{XY}(x,y) = \frac{xe^{-y}}{2}; \quad 0 < x < 2, \qquad y > 0$$

$$= 0 \qquad \textit{elsewhere}$$

(i) Find the joint cumulative distribution function of X and Y.
(ii) Find the marginal probability density functions of X and Y.

Q5 (a) Define Central Limit Theorem and give its significance. [05]

(b) Describe sequence of random variables. [05]

(c) If two random variables are independent then prove that the density of their sum equals the convolution of their density functions. [10]

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Q6 (a) Consider a random process X(t) defined by $X(t) = A \cos(\omega t + \theta)$; $-\infty < t < \infty$ where A and ω are constants and θ is a uniform random variable over $(-\pi, \pi)$. Show that X(t) is WSS. [10]

(b) Prove that if the input to a linear time invariant system is WSS then the output is also WSS. [10]

Q7 (a) Explain power spectral density. State its important properties and prove any one property. [10]

(b) State and prove the Chapman-Kolmogorov equation. [10]

TE | EXTC | V (REV) 23|5|2012
Microprocessors & microcontrollers-I

Con. 3915--12. GN–7022

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions out of remaining **six** questions.
(3) Figures to the **right** indicate **full** marks.
(4) Assume **suitable** data if **necessary**.

1. a) With the help of a diagram explain the architecture of 8085 microprocessor. 8
1. b) Write an assembly language program to multiply two 8 bit numbers for execution an 8085 processor 4
1. c) Write an assembly level program to enable all interrupts of 8051 and set their priority to low. 4
1. d) Describe any four features of ARM processor. 4

2. a) Explain interrupt structure of 8085 with a neat diagram. 10
2. b) With suitable diagrams explain handshake mode of 8155. 10

3. a) Describe addressing modes of ARM processor. 10
3. b) Explain the internal structure of Port 1 and port 3 of 8051. 10

4. Design a 8085 based microprocessor system with the following specifications: CPU of 6 MHz, EPROM of 8KB using 4KB chips, RAM of 8KB using 4KB chips, one 8255 PPI at address 20H and one 8279 at address 30h. Discuss the circuit and show the memory and I/O map. 20

5. a) Explain ICWs and OCWs of 8259 PIC 10
5. b) Write a program to convert hexadecimal number to BCD number without using DAA instruction. 10

6. a) Discuss relative merits and demerits of various data transfer techniques. 6
6. b) Write a program to transmit a byte using SOD pin. 8
6. c) Write a program to generate a 1KHz frequency square wave using 8254. 6

7. Write short notes (any four): 20
   a. Serial communication in 8051
   b. Memory related instructions of ARM microcontroller
   c. 8251 USART
   d. Reentrant and recursive subroutines
   e. 8085 flags and their usage

TE / EXTC / V (REV) 28/5/2012
R F Circuit Design

Con. 4417-12. GN–8219

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from Q. **2** to Q. **7**.
(3) Assume **suitable** data if **necessary**.

1. (a) Draw equivalent circuit representation of two wire transmission line. Explain primary and secondary parameters for the same. 5
(b) Explain chip resistors and chip inductors with neat diagram. 5
(c) Define : Smith chart, compressed Smith chart, VSWR, Reflection co-efficient, characteristic impedance. 5
(d) Explain physical properties of semiconductors. 5

2. (a) Show that return loss and insertion loss can be expressed in terms of voltage standing wave ratio as— 10

$$RL = 20 \log \frac{SWR + 1}{SWR - 1}$$

$$IL = 20 \log \frac{SWR + 1}{2\sqrt{SWR}}$$

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(b) The characteristics impedance of a coaxial cable is 75 Ω and assumed lossless. If the load is short circuit. Find the input impedance if cable is 2 wavelength, 0·75 wavelength, 0·5 wavelength and one wavelength in length. 10

3. (a) Find the attenuation of 4–element, 2·5dB ripple, low pass Chebyschev filter at $\frac{W}{W_C} = 2 \cdot 5$ 10
(b) Explain Richard's transformation and Kuroda's Identity. How they are used in realization of RF filter ? 10

4. (a) Derive power consideration for transmission line when— 10
(i) Load and source impedances are matched.
(ii) Load impedance is matched and source impedance is mismatched.
(b) Draw electric equivalent circuit for high frequency capacitor with characteristics. Compute high frequency impedance of 20 PF capacitor in terms of frequency whose dielectric medium consists of an aluminium oxide possesing a series loss tangent of 10^{-4} and whose leads are 1·25cm with AWG 26 copper wire. $\sigma_{cond} = 64 \cdot 516 \times 10^6 \ \Omega^{-1} \ m^{-1}$. 10

5. (a) Show the RF small signal circuit model of BJT and equivalent model using miller effect. Find the valves of C_{m1}, C_{m2} in terms of C_{cb}, V_{be} and V_{ce}. 10
(b) Explain structure of microstrip line along with design steps for microstrip line. 10

6. (a) Explain different filter parameters along with generic attenuation profile diagram. 10
(b) A transmission line of characteristics impedance $Z_0 = 50\Omega$ and $d = 0 \cdot 18\lambda$ is terminated in a load impedance of $Z_L = (25 - j30)\ \Omega$. Find reflection coefficient, input impedance at distance d and VSWR by using Z-Smith chart. 10

7. Write short notes on following :— 20
(a) High Electron Mobility Transistor
(b) PN–Junction diode
(c) Diode Models
(d) AC parameters of Bipolar Transistors.

T.E. (EXTC) V (REV) (3 Hours) 3/6/2012 GN-8714 May 2012

Signals & Systems [Max. Marks: 100

N.B 1) Question no 1 is compulsory.
2) Attempt any four out of the remaining questions.
3) Assume suitable data if required.

Q.1 A Determine whether the following signals are energy signals or power signals? Calculate their energy or power 05

1) $x(t) = A\cos(2\pi f_0 t + \theta)$

2) $x(n) = \left(\frac{1}{4}\right)^n u(n)$

B Let $x(n) = u(n+1) - u(n-5)$. Find and sketch even and odd parts of x(n). 05

C Mention and explain the conditions for the system to be called as IIR. 05

D State and explain Gibb's phenomenon. 05

Q.2 A i) Plot the signals with respect to time 10

$x(t) = u(t) - r(t-1) + 2r(t-2) - r(t-3) + u(t-4) - 2u(t-5)$

ii) Find the even and odd parts of the signal.

B State and prove the following properties of the Fourier transform 10

i) Frequency Differentiation and time integration.

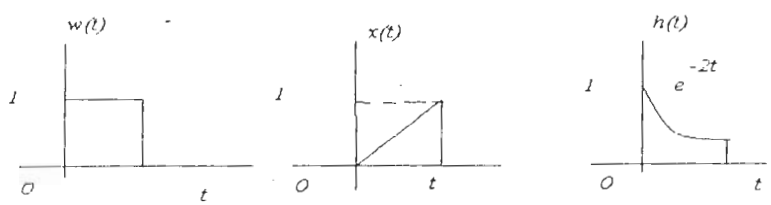
Q.3 A An analog signal x(t) is given by $x(t) = 2\cos(2000\pi) + 3\sin(6000\pi) + 8\cos(12000\pi)$ 10

i) Calculate Nyquist sampling rate .

ii) If $x(t)$ is sampled at the rate $F(s) = 5KHz$ .What is the discrete time signal obtained after sampling.

iii) What is the analog signal $y(t)$ we can reconstruct from the samples if the ideal interpolation is used.

B Find the Laplace Transform of the signals shown below. 10



Q.4 A Obtain the transfer function of the system defined by the following state space equations 10

$$\begin{bmatrix} \dot{x1}(t) \\ \dot{x2}(t) \\ \dot{x3}(t) \end{bmatrix} = \begin{bmatrix} -1 & 1 & -1 \\ 0 & -2 & 1 \\ 0 & 0 & -3 \end{bmatrix} \begin{bmatrix} x1(t) \\ x2(t) \\ x3(t) \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} u1(t) \\ u2(t) \end{bmatrix}$$

$$\begin{bmatrix} y1(t) \\ y2(t) \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} x1(t) \\ x2(t) \\ x3(t) \end{bmatrix}$$

B Find the state equation and output equation for the system given by 10

$$G(s) = \frac{1}{s^3 + 4s^2 + 3s + 3}$$

Q.5 A Find the Fourier series for the function x(t) defined by 10

$$x(t) = \begin{cases} 0 & \frac{-T}{2} < t < 0 \\ A\sin(\varpi_0 t & 0 < t < \frac{T}{2} \end{cases}$$

And x(t+T) = x(t), $\varpi_0 = \frac{2\pi}{T}$

B Obtain the Fourier transform of rectangular pulse of duration 2 Seconds and having a magnitude of 10 volts. 10

Q.6 A Develop cascade and parallel realization structure for 10

$$H(z)=\frac{z+\frac{5}{6}z^{-1}+\frac{1}{24}z^{-2}}{1-\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}}$$

B Determine the system function, unit sample response and pole zero plot of the system described by the difference equation $y(n)-\frac{1}{2}y(n-1)=2x(n)$ and also comment on type of the system. 10

Q.7 A Explain the relationship between the Laplace transform and Fourier transform. 07

B State properties of state transition matrix. 06

C State and discus the properties of the region of convergence for Z-transform. 07

TE | EXTC | V (OLD) 18|5|2012
Filter Theory

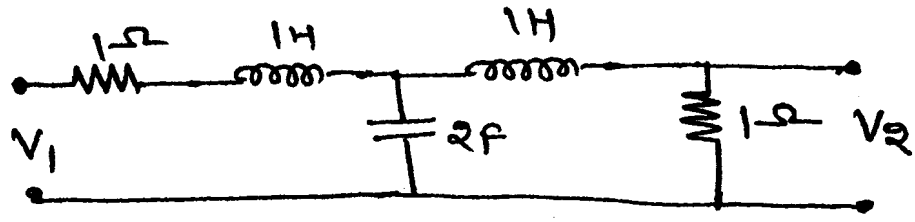
Con. 3854-12. **GN-7817**

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

N.B. : (1) Attempt any **five** questions.
(2) Assumptions made should be clearly stated.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Determine the transfer function of the following circuit. **10**



(b) Explain the difference between active and passive filter. **10**

2. (a) Determine the order of Butterworth response with the following specifications and also realize the filter circuit. **10**

$W_p = 1$ rad/sec $K_p = 3$ dB
$W_s = 2$ rad/sec $K_s = 15$ dB

(b) Explain how a leapfrog filter is developed use this concept and realize third order lowpass filter. **10**

3. (a) Design an equal resistance equal capacitance Sallen and Key low pass filter for $Q = 0{\cdot}7071$; $W_n = 6283$ rad/sec. Find the value of H_0. **10**
(b) Design and implement a IInd order infinite gain single amplifier Band pass filter for— **10**

$|H_0| = 2$; $Q = 2$ and $W_n = 10$ Krad/sec.

4. (a) Draw the circuit configuration for Generalized Impedance Convertor (GIC). Analyse it and determine its transmission parameters. **10**
(b) List properties of an Inverse Chebeshev function. **10**

5. (a) Draw a neat circuit diagram of Tow Thomas filter and derive the transfer functions for lowpass and band pass filter realization. **10**
(b) Develop state variable filter and derive expresions for voltage transfer function of high pass and band pass filter. **10**

6. (a) Explain how resistor is reaslized by a MOS switched capacitor. **10**
(b) Develop and implement a IInd order normalized low pass Butterworth filter. Transform it to a normalized high pass filter. **10**

7. Write short notes on any **two** :— **20**
(a) Akerberg-Mossberg filter.
(b) Biquadratic function.
(c) Frequency scaling and amplitude scaling with suitable example.

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