RSA (EXTC) OLD 11/05/16 Max-June-16

TE Sem V

EXTC

Sub:- RSA

QP Code : 29160

Max. Marks: 100 Duration: 3 Hr.

Note: - Question number 1 is compulsory.
Solve any four from remaining questions.
Assume suitable data wherever necessary and state it clearly

Q1a)	State and explain central limit theorem	(5)
b)	State the properties of probability density function of random variable.	(5)
c)	State the axiomatic definition of probability.	(5)
d)	Define WSS and SSS processes	(5)
Q.2 a)	Given a continuous random variable X, uniform in the interval (-C, C). Determine E{X} and variance of random variable X.	(5)
b)	Define random variable, explain with suitable example. Also define expected value and variance for continuous and discrete random variable.	(10)
c)	A discrete random variable X takes a value 1 and 0 with the probability p and (1-p). Determine the expected value and variance of random variable X.	(5)
Q.3 a)	State and prove the properties of autocorrelation and cross correlation function	(10)
b)	The joint probability density function of (X,Y) is given by $f_{XY}(x,y) = C(1-x-y)$ for $0 \le x \le 1$ and $0 \le y \le 1$ find 1. C 2. $f_X(x)$ 3. $f_Y(y)$	(10)
Q4. a)	Let X be a continuous random variable with probability density function in the interval $(0, 2\pi)$. Find the probability density function of $Y = \cos X$.	(10)
b)	Define following terms in details 1. Independent random variable. 2. Covariance 3. correlation coefficient 4. Orthogonality 5. Uncorrelatedness	(10)
Q5.a)	A random process is given by $X(t) = A \cos(\omega_0 t + \phi)$, where A and ω_0 are constant and ϕ is uniform random variable in interval $(-\pi, \pi)$. Show that X(t) is WSS process	(10)

[TURN OVER

b)	Explain power spectral density. State its important properties and prove any one property.	(10)
Q6 a)	Derive Chapman-Kolmogorov equation.	(10)
b)	Define random process with example. Define first and second order distribution and density function of a random process.	(10)
Q7)	Write a short note on any four 1. Sequence of random variable. 2. Markov process. 3. Joint and conditional probability. 4. Ergodic process. 5. Baye's theorem	(20)

RSA (EXTC) Sem V (CBGS)

Te sem-V 11/05/16 May-June-16

EXTC Sub:- RSA

QP Code : 31061

(03 Hours) 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

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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

$$F_{XY}(x,y) = (1 - e^{-\alpha x})(1 - e^{-\beta y}), x \geq 0, y \geq 0, \alpha, \beta > 0$$
$$= 0 \text{ otherwise.}$$

i) Find the marginal cdf's of X & Y. 02
ii) Show that X & Y are independent. 02
iii) Find $P(X \leq 1, Y \leq 1)$, $P(X \leq 1)$, $P(Y > 1)$ & $F(X > x, Y > y)$ 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 07

$$S(w) = b(a - |w|)/a, \quad |w| \leq a$$
$$= 0 \quad , \quad |w| > a$$

Find the autocorrelation function of the process.

[Turn Over

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 $0 \le x \le 2$, $0 \le y \le 3$ 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.

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

6a) The transition probability matrix of Markov Chain is

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

Find the limiting probabilities.

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

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 $P(X \le 1)$, $P(1 < X \le 2)$, $P(X > 1)$ & $P(1 \le X \le 2)$.

c) Write notes on the following:

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

ii) M/M/1/∞ queuing system

——End——

MPM-I (EXTC) Sem VI (old) 17/05/2016

Te Sem-V (old) May-16

EXTC

Sub:- M&M-I **QP Code : 29205**

Time 3 hrs Max Marks 100

Notes: 1. Q. 1 is compulsory

2. From remaining answer any 4 questions

3. Draw neat diagram wherever necessary

Q.1 A) How control signals are generated using IO/M, Rd and WR signals in 8085 based microprocessor system 5

B) Draw CWR format for BSR mode of 8255 PPI. Write a program to set and reset pin 3 of port C alternately with delay 5

C) Explain any five bit manipulation instructions of 8051 5

D) Explain internal and external RAM organization of 8051 5

Q.2 A) Draw and explain architecture of 8085 microprocessor 10

B) Explain handshake mode of 8155 with suitable diagram 10

Q.3 A) Write initialization sequence of 8259 PIC with neat flow diagram 10

B) Explain interrupt structure of 8051. 10

Q. 4 A) Write an 8051 assembly language program to transfer message "WORLD CUP" serially at 9600 baud, 8 bit data, 1 stop bit. 10

B) Design 8085 based system as per following specifications.

a) CPU at 5 MHz

b) EPROM of 16 KB using 4 KB

c) RAM of 8 KB using 4 KB chips 10

Explain the design with memory map.

Q. 5 A) Explain addressing modes of ARM processor. 10

B) Draw and explain timing diagram of ADD M 10

Q. 6 A) Draw and explain ARM architecture. 10

B) Compare Memory mapped I/O and I/O mapped I/O 10

Q. 7 Write note on any 4. 20

a) 8085 flag and their usage.

b) Special fully nested mode of 8259

c) Interface stepper motor with 8051 microcontroller

d) Describe features of ARM processor

e) Mode 2 of 8255

GE-Con.10230-16.

RFCD/ EXTC (Rev) 100m/ Sem
TE SEM-V (Rev/old) May-16 23/5/16

EXTC Sub:- RFCD

Q.P. Code : 29249

(3 Hours) [Total Marks :100

N.B. : (1) Question No. 1 is compulsory.
(2) Answer any four out of remaining six questions.
(3) Assume suitable data wherever required but justify the same.

1. (a) Assuming the dielectric and conductor losses in transmission line are small (i.e. $G \ll \omega C$ and $R \ll \omega L$), show that propagation constant k can be written as $k = \alpha + j\beta = \frac{1}{2}\left(\frac{R}{Z_0} + GZ_0\right) + j\omega\sqrt{LC}$ 5

Where $Z_0 = \sqrt{L/C}$ is the characteristic impedance of the line in the absence of loss.

(b) Show that the maximum value of normalized resistance is numerically equal to the voltage standing wave ratio i.e. $r_{min} = \rho$ 5

(c) You are required to build a low pass butterwort filter that provides an attenuation value of atleast 50 dB at $f = 1.5\ f_{3dB}$. What is filter order? How many components (inductors and capacitors) are required to realize this filter? 5

(d) Explain the current flow in pn junction and give the expression for I diff in terms of diffusion constant and Vdiff in terms of doping concentration. 5

2. (a) Starting from definition of time - averaged power, obtain expression for the power absorbed by the load for lossless and lossy transmission line. 10

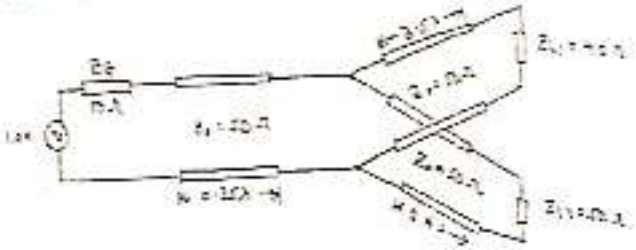
(b) The electric wave field of a positive z-travelling wave in a medium with relative dielectric constant of $\varepsilon_r = 4$ and with frequency of 5 GHz is given by Ex =Eox cos (wt - kz) V/m 10

(i) Find he magnetic field it Eox = 10^6 v/m
(ii) Determine phase velocity and wavelength.
(iii) Compute the spatial advance of the travelling wave between time intervals $t_1 = 3\mu s$ and $t_2 = 7\mu s$

3. (a) An N =3 chebyshev bandpass filter is be designed with a 3dB passband ripple for a communication link. The center frequency is at 2.4 GHz and filter has to meet a bandwidth requirement of 20%. The filter has to be inserted into a 50 Ω characteristic line impedance. Find the inductive elements and plot the attenuation response in the frequency range of 1 to 4 GHz. 10

[TURN OVER

(b) For the following system, find the both the power produced by the source and the power delivered to each load.



4 (a) A short circuited 50 W transmission line section is operated at 1 GHz and possesses a phase velocity of 75% of the speed of light. Use both the analyical and the smith chart approach to determine the shortest light required to obtain an 4.7 nH inductor

(b) Explain different filter parameters with generic attenuation profile diagram.

5. (a) Explain high frequency resistors, capacitors and inductors by giving related equations and wave forms.

(b) Explain stocky contact with the help of energy bond diagram for
(i) metal and semiconductor do not interact
(ii) metal semiconductor contact.

6. (a) Explain the design procedure of small signal BJT amplifier. (DC circuit design and RF circuit design)

(b) For two pn-diodes with abrupt function, one of which is made of Si and another is made of GaAs, with $N_A = 10^{17}$ cm^{-3} and $N_D = 2 \times 10^{14}$ cm^{-3} in both cases :
(a) Find the barrier voltage.
(b) Find the maximum electric field and the space charge region width.
(c) Plot the space charge, potential, and electric field distribution along the diode axis.

7. Write short note on following :
(a) One to one mapping between the normalized impedance plane and the reflection coefficient plane.
(b) Chip components.
(c) Parallel and series connections.
(d) Microstrip transmission lines.

RFMSA EXTC CBGS 23/5/16.

TE Sem - V (CBGS) May - 16

EXTC Sub:- RFM & A

QP Code : 31146

Max. Marks: 80 Marks

Duration: 3 Hrs

N.B
(1) Question No. 1 is Compulsory
(2) Solve any three from remaining questions
(3) Assume suitable data wherever required.

Question No.			Max. Marks
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 antenn	10

[TURN OVER

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

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

Q6. **Write short notes**

(a) Ground effects on Antenna

(b) Log periodic Antenna

(c) Loop antenna

(d) Horn antenna

SPS (TE Sem V (OLD)) 27/05/16 May-16

EXTC Sub:- SPS

QP Code : 29292

(3 Hours) [Total Marks : 100

EXTC

N.B. :- i) Question no. 1 is compulsory
ii) Solve any Four questions from remaining Q.2 to Q.7
iii) Marks shows on right hand side for each questions
iv) Any assumptions made should be clearly stated

Q.1 a) Determine whether the signal is periodic or not [20]

(i) $x(t) = 2\sin\frac{3\pi t}{4} - 6\sin\frac{3\pi t}{5}$

(ii) $x[n] = \frac{1}{14}\cos 3\pi n$

b) Determine the impulse response for the cascade of two LTI systems having impulse responses $h_1[n] = \left(\frac{1}{2}\right)^n u[n]$ and $h_2[n] = \left(\frac{1}{4}\right)^n u[n]$

c) State and discuss the properties of region of convergence for Z-transform

d) Determine whether the signal is energy signal or power signal

(i) $x(t) = 1.2\cos 7\Omega t$

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

e) Determine whether y[n] = x[-n] is (i) Memory less (ii) Causal (iii) Linear (iv) Time invariant [10]

Q. 2 a) Find the inverse Laplace transform of

(i) $X(s) = \frac{2}{s(s+1)(s+2)^2}$

(ii) $X(s) = \frac{2}{(s+1)(s^2+s+1)}$

b) Using Z - Transform perform deconvolution of the impulse response h[n] = {1, 2, 1, -1} and response y[n] = {1, 4, 8, 8, 3, -2, -1} and to extract the input x[n]. [10]

Q.3 a) For a continuous time signal x (t) = 8cos 100πt. Find out [10]

(i) Nyquist sampling rate

[TURN OVER

(ii) If fs = 800 Hz, what is discrete time signal?

(iii)If fs = 200 Hz, what is discrete time signal?

b) Realize Discrete Form I, Direct Form II, first order cascade and first order parallel structure if [10]

$$H(z) = \frac{8z^3 - 4z^2 + 11z^3}{\left(z-\frac{1}{4}\right)\left(z^2 - z + \frac{1}{2}\right)}$$

Q. 4 a) The state space representation of a discrete time system is given by [10]

$$A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix} \; ; \quad B = \begin{bmatrix} 1 \\ 2 \end{bmatrix} ; \quad C = [1 \quad 3] \; ; \quad D = [3]$$

Derive the transfer function of the system

b) State and prove convolution theorem for Z-Transform [5]

c) Derive the relation between Laplace transform and Fourier transform [5]

Q.5 a) Determine the response of the discrete time LTI system governed by the 10M difference equation $y[n] - 2y[n-1] - 3y[n-2] = x[n] + 4x[n-1]$ for the input $x[n] = 2^n u[n]$ with initial condition $y(-2) = 0, y(-1) = 5$ [10]

b) Find out the Fourier transform of the periodic signal $x(t) = \cos(2\pi ft)\, u(t)$ [10]

Q. 6 a) (i) Using Laplace transform determine the total response of the system described by the equation [10]

$$\frac{d^2y(t)}{dt^2} + \frac{5y(t)}{dt} + 4y(t) = \frac{dx(t)}{dt}$$

The initial conditions are $y(0)=0$ and $\frac{dy(t)}{dt} = 1$ for $t=0$. The input to the system is $x(t) = e^{2t}\, u(t)$

(ii) Also find the impulse response of the above system assuming initial condition as zero.

[TURN OVER

b) Find the Foutier transform of x(n) [10]

Where $x(n) = 1 \quad ; \quad |t| < T_1$

$= 0 \quad ; \quad T1 < |t| < T/2$

Q. 7 a) Draw the Direct Form structure of the FIR system described by the Transfer Function [10]

$$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{3}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{8}z^{-4} + \frac{1}{8}z^{-5}$$

[10]

b) Perform convolution of

(i) $2u(t)$ with $u(t)$

(ii) $e^{3t}\,u(t)$ with $e^{-7t}\,u(t)$

(iii) $t\,u(t)$ with $e^{-3t}\,u(t)$

TE/Sem V/Old(EXTC)/May 2016.

Date: 2/5/12

EXTC

Sub:- PCS

QP Code : 29336

OLD CORSE

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) In total solve **five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable **data if necessary**.

1. (a) What is the effect of feedback in open loop system ? 4
(b) Derive the transfer function of the network shown in fig. 1. 4

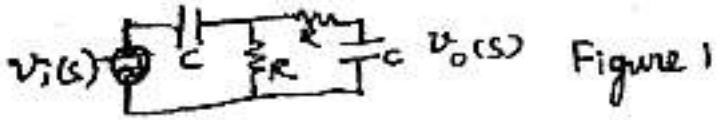


Figure 1

(c) Find the rise time of unity feedback system with open loop transfer function G(s) for step input of 10 units. 4

$$G(s)=\frac{10}{s(s+1)}$$

(d) What is the effect of PD controller on second order system ? 4
(e) State Nyquist theorem. 4

2. (a) Consider unity feedback system with forward transfer function $G(s) = K(2s+1)/s(5s+1)(1+s)^2$ for input $r(t) = 10+5t$, find the minimum value of K so that steady state error is 0.1. 10
(b) Discuss response of second order system for step input. 10

3. (a) Derive the transfer function for the mechanical system shown in fig. 2 10

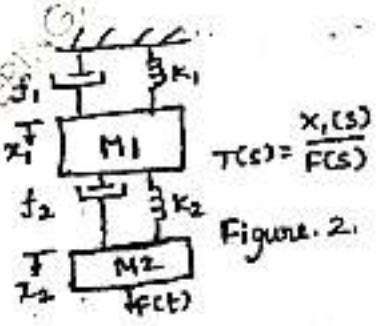


Figure. 2.

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(b) For the block diagram shown in figure 3, find the transfer function using block diagram reduction technique. 10

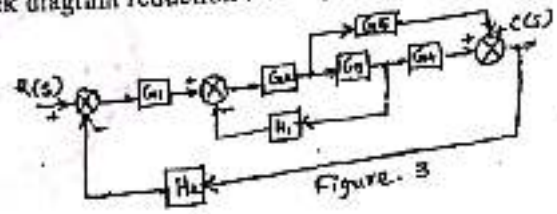
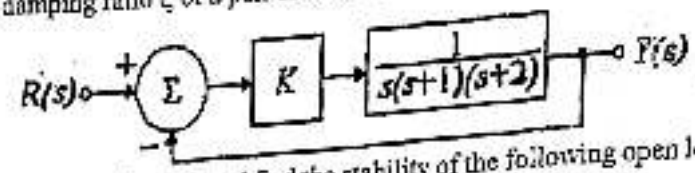


Figure. 3

4. (a) Sketch the root locus of the following system. Determine the value of K such that the damping ratio ζ of a pair of dominant complex conjugate closed-loop is 0.5. 10



(b) Draw the Nyquist plot and find the stability of the following open loop transfer function of unity feedback control system. 10

$G(s)\ H(s) = K\ (s+2)\ /\ s^2(s+1)$

If the system is conditionally stable, find the range of K for which the system is stable.

5. (a) A open loop transfer function of the system $G(s) = 10000/s(1+0.1s^2)$. Find the following parameters. 10

(i) Gain margin and phase margin
(ii) Magnitude at an angular frequency of $\omega = 20$ rad/sec
(iii) Stability of system with its bode plot.

(b) Briefly explain about lead-lag compensators. 10

6. (a) Define the following frequency response specifications 10

(i) Resonance Peak
(ii) Bandwidth
(iii) Cut off frequency
(iv) Gain margin

(b) Explain ON-OFF control action with example. 10

7. Write short notes on any two. 20

(a) Stepper Motor
(b) Synchros
(c) Mason's Gain Formula

IC EXTC Sem V (CBGS) 02/06/16

EXTC

Sub:- IC

Date: May-16

QP Code : 31228

(3 Hours) [Total Marks : 80

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

1. Solve the following (any five) :- 20
   (a) Compare open loop & closed loop configurations of operational amplifier.
   (b) Draw the diagram of a floating load voltage to current converter and derive the expression for the output current.
   (c) Differentiate between inverting & non-inverting comparators.
   (d) Explain the functional block diagram of timer 555.
   (e) Explain current fold-back protection in voltage regulators.
   (f) Draw the waveforms for the outputs of IC 7490 with respect to the clock when it is used as a bi-quinary decade counter.

2. (a) Draw a neat circuit diagram for an instrumentation amplifier using three op-amps & derive the expression for its gain. Explain how the gain can be varied. 10
   (b) Draw a neat diagram of a Wien bridge oscillator using op-amp. Derive its frequency of oscillation. What are the values of R & C if its frequency of oscillation = 1 kHz? 10

3. (a) With the help of a neat diagram & voltage transfer characteristics explain the working of a non-inverting Schmitt trigger. Derive the expressions for the threshold levels & explain how they can be varied. 10
   (b) Draw the circuit diagram for a square and triangular waveform generator using operation amplifiers. With the help of waveforms at suitable points in the circuit explain its working. Explain how the duty cycle can be varied. 10

4. (a) Design a voltage regulator using IC 723 to give output voltage of 15 V and output current of 1.5 A. 10

[TURN OVER

(b) With the help of a neat diagram explain how IC LM 317 can be used as a variable voltage regulator. 6

(c) Differentiate between linear regulator & switching regulator. 4

5. (a) Draw the diagram for an astable multivibrator using timer 555. Design the same for a frequency of 5 KHz with duty cycle 70%. Draw the waveforms across the charging capacitor and at the output. 10

(b) With the help of a neat circuit diagram explain the working of universal shift register IC 74194 as a 4 bit, 4 state ring counter with single circulating 'zero'. 10

6. Write short notes on any four :- 20

(a) Frequency to voltage converter
(b) Waveform generator XR 2206
(c) Voltage controlled ascillator 566
(d) Synchronous counter 74163
(e) Arithmetic logic unit 74181
