TE (EXTC) Sem V (old) 7/12/15
signals and systems

QP Code : 1764

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question no. 1 is compulsory
(2) Answer any **four** questions out of remaining **six** questions
(3) **Figure** to **right** indicates **full** marks
(4) **Illustrate** the answers with **sketches** whenever **required.**

1. (a) Prove differentiation in Z domain property of Z transform. 5
(b) Determine the direct form-I realisation of the following transfer function 5
$H(z) = 1 - 0.7z^{-1} + 0.4z^{-2}$
(c) Let x[n] =u[n]-u[n-5]. Find and sketch even and odd parts of x[n] 6
(d) Determine whether the following signals are energy signals or power signals? Calculate their energy or power 4
(i) $x(t) = A\cos(2\pi f_0 t + \theta)$
(ii) $x(n) = \left(\frac{1}{4}\right)^n u(n)$

2. (a) Convolve $x(t) = 1 \quad 0 \le t < 1$
$= 0$ elsewhere
with $h(t) = 1 \quad 0 \le t < 1$
$= 0$ elswhere 10

(b) Consider the analog signal $x(t) = 8\sin 200\pi t$ 10
(i) Determine minimum required sampling rate to avoid aliasing.
(ii) If the signal is sampled at the rate Fs =100Hz.
What is discrete time signal obtained after sampling.
(ii) If the signal is sampled at the rate Fs=300Hz, what is discrete time signal obtained after sampling.

3. (a) Determine the exponential form of Fourier series representation of signal shown below in fig 3(a). Hence determine the trigonometric form of Fourier series. 10

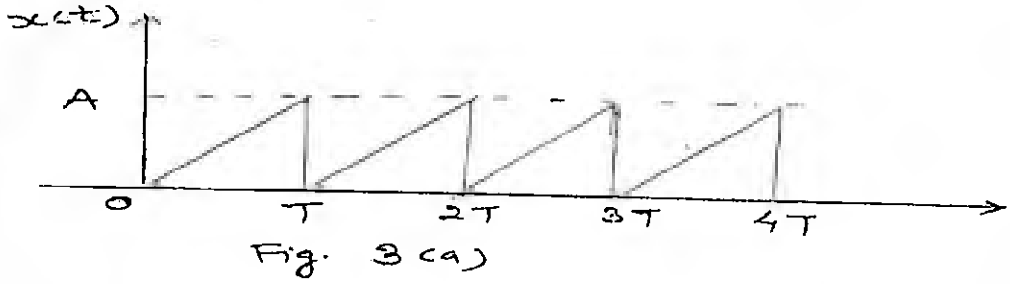

Fig. 3(a)

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(b) Determine the output response of the system $h(t) = u(t)$ to an input $x(t) = e^{-at}u(t), a > 0$ 10

4. (a) Find z transform along with its ROC of 10

(i) $x[n] = \left(\frac{-1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^n U(-n-1)$

(ii) $x[n] = 2^n u(n-2)$

(b) Prove that LTI system is stable if it's impulse response is absolutely summable 10

5. (a) Obtain the inverse Laplace transform of 10

(i) $x(s) = \frac{5s^2 - 15s - 11}{(s+1)(s-2)^3}$ (ii) $x(s) = \frac{s-3}{s^2 + 4s + 13}$

(b) Realize Direct Form-I, Direct Form-II, First order cascade and First order paraller structures if 10

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

6. (a) The difference equation of the system is given by 10
$y(n) = 3y[n-2] + 4[n-1] + x[n]$
If $x[n] = [0.5]^n u[n]$ and
$y[-1] = 1, y[-2] = 0$
Find (i) Zero Input Response
(ii) Zero State Response
(iii) Total Response

(b) Prove time sifting property of Fourier transform 5

(c) Determine the unit step response of the system whose impulse response is given as $h(t) = 3t\, u(t)$ 5

7. (a) Determine the state variable model of 10
$y[n] = -2y[n-1] + 3y[n-2] + 0.5y[n-3] + 2x[n]$

(b) Usign a suitable method obtain state transition matrix e^{AT} for the following 10

system $\begin{bmatrix} 3/4 & 0 \\ -1/2 & 1/2 \end{bmatrix}$

T.E sem V EXTC MP&MC-I
COLD 24/11/15

QP Code : 1676

Total marks:100

(3 Hours)

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

(2) Solve any **four** questions from the remaining **six** questions.

(3) **Figures** to the **right** indicate **full** marks.

(4) Assume suitable **data** where **necessary.**

1. (a) Specify the register contents and flag status 0f 8085 as following instructions are executed. 5

A	B	S	Z	CY
xx	xx	x	x	x

XRA A

MVI B, 5A H

SUI 5F H

ANA B

HLT

(b) Explain how interrupts are handled in 8051. 5

(c) Explain functions of ALE and IO/$\overline{M}$ signals of 8085 microprocessor. 4

(d) Explain any three addressing modes of ARM processor. 6

2. (a) Explain addressing modes of 8051. 10

(b) Design a 8085 based microprocessor based system with following specifications: CPU of 3 MHz, EPROM of 16 KB using 8 KB chips and RAM of 16 KB using 8 KB chips. Discuss schematic and show the memory map. 10

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3. (a) Draw and explain architecture of ARM processor. 10

(b) Interface 8259 with 8085 using I/O mapped I/O technique and initialize 8259 to meet following specifications 10

. (i) Level triggered , single and ICW4 not needed.

(ii) Mask interrupts IR2 and IR4.

(iii) Interrupt vector address for IR0 is 4250 H.

4. (a) Explain control word register format of 8253 10

(b) Explain the following instructions of ARM processor. 10

(i) BNE label (ii) ADDEQ R1,R2,R3 (iii) LDRB R2, [R1],#1

(iv) SMULTB R1,R2,R3 (v) MVN R2,#10

5. (a) Explain TMOD and TCON register of 8051. 10

(b) Write assembly language for 8085 to multiply two 8 bit number using add and shift method. 10

6. (a) Explain the interrupt structure of 8085. 10

(b) Interface DAC 0808 to 8051 and write assembly language program using 8051 to generate triangular waveform. 10

7. Write short note on any four of the following 20

(a) Serial communication in 8085. (b) PORT 3 structure of 8051.

(c) BSR mode of 8255. (d) PSW register of 8051.

(e) 8051 unconditional jump instructions.

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TE - Sem V (OLD) R2007 (EXTC) 18/11/2015

RSA

QP Code : 1631

Max. Marks: 100 Duration: 3 Hr.

Instructions:

(1) Question No.1 is Compulsory.
(2) Solve any four out of remaining six questions.
(3) Assume suitable data if necessary.

Q1(a)	State and prove Baye's Theorem.	05
(b)	Suppose X and Y are two random variables, when do we say that X and Y are 1) Orthogonal 2) Uncorrelated	05
(c)	Prove that Poisson process is Markov Process.	05
(d)	Define probability density function. State and prove any two properties of probability density function (p.d.f).	05
Q2(a)	Box 1 contains 5 white balls and 6 black balls. Box 2 contains 6 white balls and 4 black balls. A box is selected at random and then a ball is chosen at random from the selected box. 1) What is the probability that the chosen ball will be a white ball? 2) Given that the ball chosen will be white, what is the probability that it came from Box1?	10
(b)	The transmission times X of messages in a communication system obeys the following exponential probability law with parameter K. $f(x) = k\, e^{-\lambda x}\ , x > 0$ 1) Find the value of K. 2) Find the probability density function(p.d.f) of X and cumulative density function (c.d.f) of X. sketch both functions.	10
Q3(a)	The joint probability density function of a two dimensional random variable (X,Y) is given by $f_{x,y}(x,y) = ke^{-(x+y)}, x > 0, y > 0$ 1) Find the value of K. 2) Find the marginal probability density functions of X and Y. 3) Check for independence of X and Y.	10
(b)	If x and y are two independent exponential random variables and Z = X + Y, then prove that the probability density function of Z is given by convolution of their individual density functions.	10
Q4(a)	Find the moment generating function of Binomial distribution and hence, find its mean and variance.	10

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QP-Con. 6862-15.

(b) Let $X_1, X_2 \ldots$ be a sequence of random variables. 10
Define 1) Convergence almost anywhere
2) Convergence in probability
3) Convergence in mean square sense
4) Convergence in Distribution
for the above sequence for a random variable X.

Q5(a) State and prove Chapman-Kolmogorov equation. 10

(b) 1) Define Central Limit Theorem and give its significance. 10
2) Define strong law of large numbers.
3) Describe sequence of random variables.

Q6(a) Explain power spectral density function. State its important properties and prove any one property. 10

(b) Show that the random process given by 10

$$x(t) = A\cos(w_0 t + \theta)$$

where A and w_0 are constants and θ is uniformly distributed over $(0, 2\pi)$ is Wide Sense stationary(WSS).

Q7(a) Three boys A, B, C play a game of throwing a ball to each other. A always throws the ball to B and B always throw the ball to C, however C is just as likely to throw the ball to B as to A. Find the transition matrix. Show that the process is Markovian. Also classify the states. 10

(b) Write Short notes on any two : 10

1) Ergodic Process
2) Poisson Process
3) Gaussian Process

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