

- 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 $h_1[n] = \left(\frac{1}{3}\right)^n u[n]$ 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

Q. 2 a) Find the inverse Laplace transform of [10]

(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 $x(t) = 8 \cos 100\pi t$. Find out [10]

(i) Nyquist sampling rate

(ii) If $f_s = 800 \text{ Hz}$, what is discrete time signal?

(iii) If $f_s = 200 \text{ Hz}$, 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 [10]

by the equation

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

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 Fourier transform of $x(n)$ [10]

$$\begin{aligned} \text{Where } x(n) &= 1 & ; & \quad |t| < T_1 \\ &= 0 & ; & \quad T_1 < |t| < T/2 \end{aligned}$$

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

[10]

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

b) Perform convolution of

[10]

- (i) $2u(t)$ with $u(t)$
 - (ii) $e^{3t}u(t)$ with $e^{-7t}u(t)$
 - (iii) $t u(t)$ with $e^{-3t}u(t)$
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Sem-V (old) EXTC
Microprocessor & Microcontrollers
-I

17/5/16

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
Explain the design with memory map. 10
- 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 3 of 8255.

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