CBCS Scheme

USN | | | | | | | | | | |

15EE52

Fifth Semester B.E. Degree Examination, June/July 2018
Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain the various internal blocks of a CPU with necessary block diagram. **(08 Marks)**

b. Explain the various addressing modes of 8051 with an example for each. **(08 Marks)**

OR

2 a. Discuss the internal memory organization of 8051 microcontroller. **(06 Marks)**

b. Identify the addressing modes of source operand in the following instructions:
i) MOV A, #2CH ii) MOV A, @R0
iii) ADD A, 50h iv) MOVC A, @A+dptr **(04 Marks)**

c. Design an memory interface to correct 4 KB ROM memory using 74L5138 decoder with address space 4000h-4fffh. **(06 Marks)**

Module-2

3 a. Explain the operation of following instructions of 8051:
i) MOVX A, @dptr
ii) DJN2 R3, rpt
iii) ADDC A, 40h **(06 Marks)**

b. Write an 8051 ALP to find average of marks scored by student in 6 subjects [Max per subject = 20]. Assume the marks are stored from location 40h and the average is to be stored at location 50h. **(06 Marks)**

c. Write an 8051 ALP to read content of Port 1 and send it to Port 2 after inversion. The operation should be continuous. **(04 Marks)**

OR

4 a. Discuss call and jump instruction types and ranges of branching in each case. **(06 Marks)**

b. Write an 8051 ALP to convert a 2 digit BCD number to its equivalent binary (Hexadecimal) value. **(06 Marks)**

c. How many IO ports are available in 8051? Give the usage of all the IO ports mentioning any alternate use if they have. **(04 Marks)**

Module-3

5 a. What are the various data types supported by 8051 C? Mention the range of representation in each case. **(06 Marks)**

b. Explain TMOD-SFR with necessary format. **(04 Marks)**

c. Write an 8051-C program to realize a square wave of frequency 2 kHz on P2.0. Use timer 1, mode 1 for the operation. Take crystal frequency as 11.0592 MHz. **(06 Marks)**

OR

6 a. Write an 8051 C program to toggle bits of port 1 with arbitrary delay. The operation has to be continuous. **(06 Marks)**

b. Write a program segment to configure timer 1 in 16-bit counting mode to count internal clock and timer 0 in 8-bit auto reload mode to count internal clock. Assume software control for the operation. **(04 Marks)**

c. Write on 8051 C program to generate square wave of frequency 2.5 kHz on P1.0 using Timer 1 mode 2. Take crystal frequency of 12 MHz. **(06 Marks)**

Module-4

7 a. Explain the use of various bits of SCON-SFR. **(04 Marks)**

b. Write an 8051 C program to transmit a message "VTU Belagavi" serially at a baud rate of 9600. Use 8 bit data with one stop and one start. **(08 Marks)**

c. What are the various interrupt available in 8051? Mention vector ROM address and priority of each of the interrupts. **(04 Marks)**

OR

8 a. Explain the need for MAX 232 line driver for connecting RS232 to 8051. Show the interface of RS232 to 8051 using MAX 232. **(06 Marks)**

b. The value of IP-SFR is 00001100b. Explain the priority of interrupts. **(04 Marks)**

c. Write an 8051 program to receive a data byte serially and send to P1. Use baud rate of 4800. **(06 Marks)**

Module-5

9 a. Interface an DAC to 8051 and write an program to generate triangular wave using DAC interface. **(08 Marks)**

b. The direction of a DC motor is controlled by using a H-bridge as shown below in Fig.Q9(b).

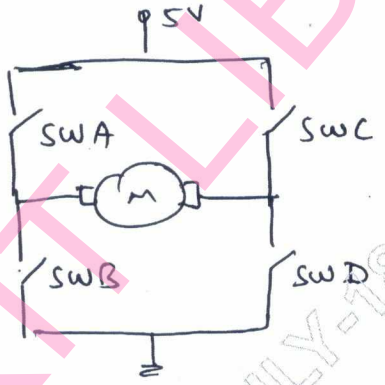

Fig.Q9(b)

SW A is connected to P1.0, SW B to P1.1, SW C to P1.2 and SW D to P1.3. Write a program to monitor a switch at P2.0.
If switch = 0 rotate motor in a direction
= 1 rotate motor in opposite direction. **(08 Marks)**

OR

10 a. Explain the various fields of 8255 control word format. Draw the control word format. **(06 Marks)**

b. Interface an LCD to 8051 and write a program using 8051-C to display message "Good day". **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15EE54

Fifth Semester B.E. Degree Examination, June/July 2018
Signals and Systems

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Prove that

i) $\int_{-a}^{a} x(t)dt = 2\int_{0}^{a} x(t)dt$; if x(t) is even

ii) $\int_{-a}^{a} x(t)dt = 0$; if x(t) is odd. **(06 Marks)**

b. What is the total energy of the rectangular pulse shown in Fig.Q.1(b)? **(05 Marks)**

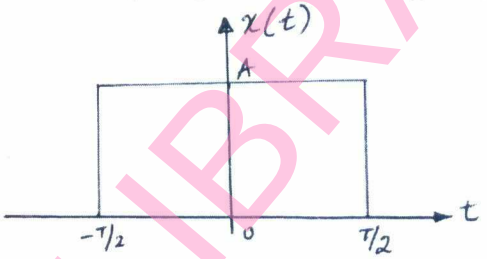


Fig.Q.1(b)

c. Determine whether the system $y(t) = x^{(t/2)}$ is i) Linear ii) Time-invariant iii) Memory iv) Causal v) Stable. **(05 Marks)**

OR

2 a. Check whether the following signals are periodic or not. If periodic, find the fundamental period: i) $x_1[n] = \cos 2\pi n$ ii) $x_2[n] = \cos 2n$. **(06 Marks)**

b. For the continuous-time signal x(t) shown in Fig.Q.2(b), sketch the signal y(t) = x(3t + 2). **(05 Marks)**

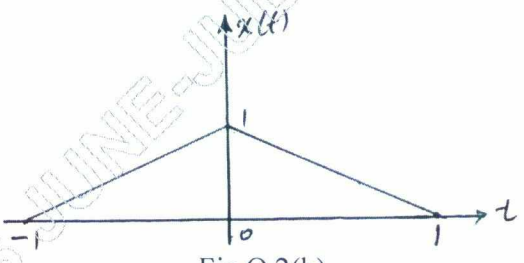


Fig.Q.2(b)

c. Sketch the signal, x(t) = -u(t + 3) + 2u(t + 1) – 2u (t – 1) + u (t – 3). **(05 Marks)**

Module-2

3 a. Consider the input signal x[n] and the impulse response h(n) given below:

$$x[n]=\begin{cases}1 & 0\le n\le 4\\ 0 & \text{elsewhere}\end{cases} \qquad h[n]=\begin{cases}\alpha^n & 0\le n\le 6\\ 0 & \text{elsewhere}\end{cases}$$

Compute the output signal y[n]. **(05 Marks)**

b. Evaluate the system response of the system

$\ddot{y}(t)+5\dot{y}(t)+6y(t)=2e^{-t}u(t)$ with $y(0)=0,\ \dot{y}(0)=1$. **(05 Marks)**

c. Draw direct form I and direct form II implementation for the following difference equations:

i) $y(n)+\frac{1}{4}y(n-1)-\frac{1}{8}y(n-2)=2x(n)+3x(n-1)$

ii) $y(n)-\frac{1}{9}y(n-2)=x(n)+2x(n-1)$. **(06 Marks)**

OR

4 a. For each of the impulse response listed below,

i) $h(t)=e^{-2|t|}$ ii) $h(t)=e^{2t}u(t-1)$

Determine whether the corresponding system is i) Memory less ii) Causal and iii) Stable. **(06 Marks)**

b. Evaluate the continuous-time convolution integral given below:

$y(t)=e^{-2t}u(t)*u(t+2)$. **(05 Marks)**

c. For the system given below, compute the zero-input, zero-state and total response, assuming

$x[n]=u[n]$ and $y[-1]=y[-2]=1$, $y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n-1)$. **(05 Marks)**

Module-3

5 a. Prove the following properties of Fourier transform:

i) Frequency shifting property ii) Time-differentiation. **(06 Marks)**

b. For the rectangular pulse shown in Fig.Q.5(b), draw the spectrum. **(05 Marks)**

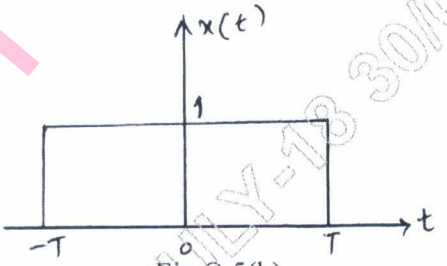
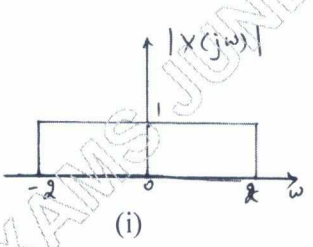
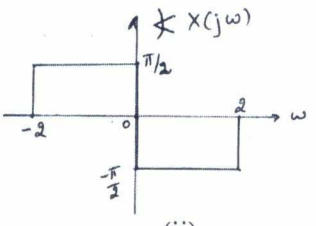


Fig.Q.5(b)

c. Determine the time-domain signal corresponding to the spectrum shown in Fig.Q.5(c) (i) and (ii) respectively. **(05 Marks)**



(i)



(ii)

Fig.Q.5(c)

OR

6 a. The impulse response of a continuous-time LTI system is given by $h(t)=\frac{1}{RC}e^{-t/RC}u(t)$. Find the frequency response and plot the magnitude and phase response. **(05 Marks)**

b. Prove that, if $x(t)\xleftrightarrow{FT}x(jw)$ then, $\int_{-\infty}^{t}x(\tau)d\tau\xleftrightarrow{FT}\frac{x(jw)}{jw}+\pi x(jo)\delta(w)$. **(05 Marks)**

c. Obtain the frequency response and the impulse response of the following system described by the differential equations:

i) $\frac{dy(t)}{dt}+8y(t)=x(t)$

ii) $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=\frac{-dx(t)}{dt}$. **(06 Marks)**

Module-4

7 a. Compute the DTFT of the following signals:

i) $x(n)=2^n u(-n)$

ii) $x(n)=a^{|n|}\ ;\ |a|<1$

iii) $x(n)=(\alpha^n\sin\Omega_0 n)u(n)\ ;\ |\alpha|<1$. **(06 Marks)**

b. Obtain the frequency response and the impulse response of the system having the output y(n) for the input x(n) as given below.

$x(n)=\left(\frac{1}{2}\right)^n u(n)\ ;\ y(n)=\frac{1}{4}\left(\frac{1}{2}\right)^n u(n)+\left(\frac{1}{4}\right)^n u(n)$. **(05 Marks)**

c. A discrete-time LTI system described by $y(n)-\frac{1}{2}y(n-1)=x(n)+\frac{1}{2}x(n-1)$

i) Determine the frequency response H(Ω).

ii) Find the impulse response h(n) of the spectrum. **(05 Marks)**

OR

8 a. Find the inverse DTFT of

i) $x(\Omega)=e^{-j4\Omega}\ ,\ \frac{\pi}{2}<|\Omega|<\pi$

ii) $x(\Omega)=\frac{3-\frac{5}{4}e^{-j\Omega}}{\frac{1}{8}e^{-j2\Omega}-\frac{3}{4}e^{-j\Omega}+1}$. **(08 Marks)**

b. State and explain Parseval's theorem of discrete time Fourier transform. **(04 Marks)**

c. Obtain the difference equation for the system with frequency response. **(04 Marks)**

$H(e^{j\Omega})=1+\frac{e^{-j\Omega}}{\left(1-\frac{1}{2}e^{-j\Omega}\right)\left(1+\frac{1}{4}e^{j\Omega}\right)}$.

Module-5

9 a. Find the Z-transform of the following:

i) $x(n) = n\sin\left(\frac{\pi}{2}n\right)u(-n)$

ii) $x(n) = \left(\frac{1}{2}\right)^n u(n) * \left(\frac{1}{3}\right)^n u(n)$. **(07 Marks)**

b. List the properties of ROC. **(04 Marks)**

c. Find the inverse Z-transform of the following using partial fraction expansion:

$$X(Z) = \frac{1-\frac{1}{2}z^{-1}}{1+\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}; \quad |z| > \frac{1}{2}.$$ **(05 Marks)**

OR

10 a. A causal LTI system is described by the difference equation $y(n) = y(n-1) + y(n-2) + x(n-1)$.

i) Find the system function.

ii) Plot the poles and zeros.

iii) Indicate the ROC.

iv) Find the unit sample response of this system.

v) Find the stable (non causal) unit sample that satisfies the difference equation. **(06 Marks)**

b. Solve the following equation using unilateral Z-transform $y(n) - \frac{3}{2}y(n-1) + \frac{1}{2}y(n-2) = x(n)$ for $n \geq 0$ with initial conditions y(-1) = 4, y(-2) = 10 and $x(n) = \left(\frac{1}{4}\right)^n u(n)$. **(05 Marks)**

c. Determine the step response of the system $y(n) = \alpha y(n-1) + x(n)$; $-1 < \alpha < 1$ with initial conditions y(-1) = 1. **(05 Marks)**

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