Q. P. Code : 38828

(3 Hours) Total Marks:80

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

(2) Solve any Three Questions from Question No 2 to Question No6

(3) Assume suitable data if required.

Q1) Solve **any four** 20

a) Explain in brief ROC conditions of z transform.

b) Sketch even & odd parts of x (n)=u(n)-u(n-5).

c) Find Initial and final values of signal $x(s) = \dfrac{(s+10)}{(s^2+2s+2)}$

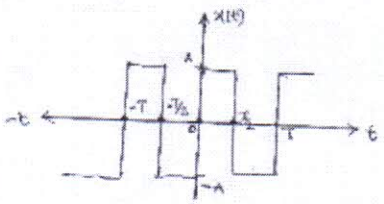
d) Determine Z transform and ROC of signal $x(n)=a^n\cos(\omega n)u(n)$

e) Explain Gibb's Phenomenon.

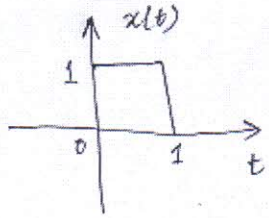
Q2) a) Determine the convolution of the following signal using graphical method. 08

$X_1(n) = \{1, \underset{\uparrow}{2}, 1\}$ and $X_2(n) = \{2, \underset{\uparrow}{1}, 2\}$

b) Determine Fourier series representation of following signal. 08



c) Determine Laplace transform of following waveform. 04



Q3) a) Solve the difference equation for the system given below using z-transform. 08

y(n)-3y(n-1)-4y(n-2)=x(n)+2x(n-1)

b) Obtain inverse Laplace transform with all possible ROC. 08

$X(s) = \dfrac{8}{(s+2)^3(s+4)}$

c) State and prove time shifting property of continuous time Fourier transform. 04

TURN OVER

Q4) a) Compute the convolution integral and sketch output.

$x(t) = 1$ for $0 \le t \le 2$

$= 0$ otherwise

$h(t) = e^{-2t}\, u(t)$

b) Find inverse Z-transform of $x(z)=\dfrac{z^2}{z^2 - z + 0.5}$

c) Determine whether following signals periodic or not. If periodic find fundamental period.

i) $x(t)=14+40\cos(60\pi t)$

ii) $x(n)=\cos^2[\dfrac{\Pi}{4} n]$

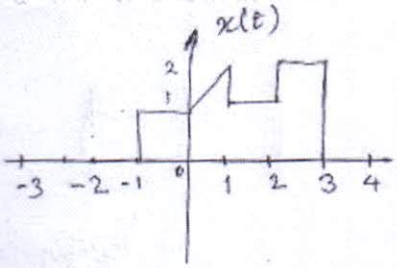
Q5) a) Determine whether the following signals are energy or power.

i) $x(t)=e^{-4t}u(t)$

ii) $x(n)=(\dfrac{1}{6})^n u(n)$

b) Sketch the following signals, if x (t) is as shown below.

i)x(-t) ii)x(2t+2) iii)x(-t+2) iv)x(-2-t)



c) State relationship between Laplace, Fourier and Z- transform.

Q6) a) Determine if following systems are memoryless, causal, linear, timeinvarient.

$y(n)=n^2\, x(n)$

b) Plot the signal w.r.t.time.

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

c) The differential equation of the system is given by $y''(t)-y'(t)-6y(t)=x(t)$.Find

i) H(s)

ii) h(t)

iii) Step response of the system.

M V Paper / Subject Code: 30902 / APPLICATIONS OF MICROCONTROLLER-I NOV. 18

(CBSGS)

Q.P. CODE: 34952

Time- 3 Hours **Total Marks-80**

N.B.: **(1)** Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from remaining **five** questions.
(3) Assume suitable **data** wherever necessary.
(4) Figure to right indicate **full** marks.
(5) Illustrate your answer with neat **sketches** wherever necessary.

1. Answers the following questions:- (20)
   a) Explain Harvard and Von Neumann architecture with block diagram.
   b) Discuss memory organization of RAM in 8051 Microcontroller.
   c) LEDs are connected to bits P1 and P2. Write an 8051 C program that shows the count from 0 to FFH on the LEDs.
   d) Explain SBUF register of 8051 microcontroller and explain procedure how data is loaded in to SBUF.

2. a) List the important features of RISC and CISC processors. (8)
   b) Compare 8051, 8052 and 80151 microcontrollers. (8)
   c) Explain Timer 2 operation in Auto-Reload mode of 8052 microcontroller. (4)

3. a) Write assembly program to convert packed BCD 99H to two ASCII numbers and describe the logic used for this conversion. (10)
   b) Write an 8051 C program to send two different strings to the serial port. Assuming that SW is connected to pin P2.0, monitor its status and make a decision as follows:
   SW = 0: send HI
   SW = 1: send BYE.
   Assume XTAL = 11.0592 MHz, baud rate of 9600, 8-bit data, 1 stop bit. (10)

4. a) Explain interfacing of DC motor with 8051. Add a switch to pin P2.7. Write a program to monitor the status of switch and if SW= 0, the DC motor moves clockwise and if SW = 1, the DC motor moves counterclockwise. (10)

   b) The word "NIKITA" is to be burned in the ROM location starting from 0400H. Write assembly language program to do this and to read this into internal RAM location starting from 50H. (10)

5. a) Interface LCD with 8051 microcontroller. Write a assembly program to display "HELLO" using MOVC instruction. (10)
   b) Write a program to copy the value 55H into RAM memory locations 40H to 45H using
   (i) Direct addressing mode,
   (ii) Register indirect addressing mode without a loop, and
   (iii)With loop. (10)

6. Attempt any **TWO** questions:- (20)
   a) Write a program to generate a square wave of 50% duty cycle on the P1.5 bit. Timer0 is used to generate the time delay. Calculate the amount of time delay. Assume XTAL=11.0592MHz.
   b) Draw and explain Interrupt internal circuit diagram with its registers of 8051 Microcontroller.
   c) Explain implementation of Traffic Light Controller using 8051 microcontroller.

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TRU / SEM V (CBSGS)

Paper / Subject Code: 30904 / CONTROLS SYSTEM DESIGN / NOV. 18

(3 Hours)

Total Marks: 80

N.B. 1. Question **No.01** is **Compulsory.**
2. Attempt any **three** questions from remaining **five** questions.
3. Assume suitable data if required.
4. Figure to right indicate full marks.

Qu.01. Answer the following 20

a) Explain the need of compensator.
b) Define controllability and observability.
c) State the advantages of modern control theory over conventional control theory.
d) Derive the transfer function of lead compensator.

Qu.02. a) Explain design steps of lag compensator using Bode plot technique. 10

b) Obtain the diagonalized matrix (M) for given system matrix: - 10

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -3 & -3 \end{bmatrix}$$

Qu.03. a) Design PID Controller for the system 10

$$G(s) = \frac{K}{s(s+1)(s+5)}$$

Determine the compensated block $G_C(s)$.

b) Open loop transfer function of uncompensated system is 10

$$G(s) = \frac{K}{s(s+1)(s+2)}$$

Design lead compensator to meet following specification:-
Damping factor $\zeta = 0.7$, undamped natural frequency $\omega_n = 1.5$ rad/sec and $K_V \leq 5$.

Qu.04. a) Obtain the response of the system which is represented by following state equation 10

$$\dot{X} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U$$

Assume initial conditions $X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

b) Explain the design steps of lag-lead compensator using root locus technique. 10

Qu.05. a) For a unity feedback system 10

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

Design a suitable compensator with the following specification:-
$K_V = 12$ /sec
Phase Margin $\Phi_m = 40^0$

b) Obtain the state feedback matrix K for the system 10

$$\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix} X(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U(t)$$

$$Y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} X(t)$$

The closed loop poles are at $-1.5 \pm j\,1.5$.

Qu.06. a) What is state transition matrix (STM)? List the properties of STM. 10
Compute the STM for a system matrix:-

$$A = \begin{bmatrix} 0 & 1 \\ -1 & -3 \end{bmatrix}$$

b) Obtain transfer function of the following system 10

$$\begin{bmatrix} \dot{X}_1(t) \\ \dot{X}_2(t) \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} X_1(t) \\ X_2(t) \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} U(t)$$

$$Y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} X(t)$$

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Q.P. Code: 24938

Time: 3 Hours **Marks: 80**

(1) Question no. 1 is compulsory.
(2) Attempt any three questions from remaining five questions.
(3) Assume suitable data wherever necessary.

Q.1. (a) Explain the terms: **20**

(i) Signal Level and Bias changes
(ii) Filtering and impedance matching

(b) Draw and explain zero crossing detector circuit.

(c) Define filters. What are the advantages of active filters over passive filters?

(d) A bridge circuit has R1 = R2= R3 = R4= 120Ω resistances and a 10V supply. Suppose a $3\frac{1}{2}$ digit DVM on a 200mV scale will be used for the null detector. Find the resistance resolution for measurements of R4.

Q.2. (a) Explain with neat block diagram, the generalized Data Acquisition System. **10**

(b) Explain Dual slope Analog-to-digital Converter with diagram and waveform. **10**

Q.3. (a) Derive output voltage equation for 3 op-amp instrumentation amplifier. Explain any one typical application with neat diagram. **10**

(b) Draw the circuit for practical integrator. Draw the frequency response of ideal and practical integrator. Discuss the problems associated with ideal integrator. **10**

Q.4. (a) Design and explain operation of astable multivibrator using IC555 to generate output signal with frequency of 1kHz and duty cycle of 75%. **10**

(b) Draw and explain the principle and construction of metal strain gauges. What is the signal conditioning associated with it. **10**

Q.5. (a) Draw and explain circuit diagram of sample and hold circuit with waveforms and list the applications. **10**

(b) A potentiometer displacement sensor is to be used to measure work-piece motion from 0 to 10cm. The resistance changes linearly over this range from 0 to 1kΩ. Develop signal conditioning to provide a linear, 0 to 10V output. **10**

Q.6. Write short notes on any four of the following. **20**

(a)SMPS
(b)Data logger
(c)PLL
(d)Peak detector