E/ INST / Sem-I (CBSGS) / Signal & Systems / NOV. 17

Q. P. Code: 23855

(3 Hours) **Total Marks: 80**

N.B. : (1) Question No. **1** is compulsory.
(2) Solve any **Three** questions from question no. 2 to question no. 6.
(3) Assume suitable data if required.

1. Solve any **four** questions . 20

(a) Write all the properties of the Fourier transform and derive differential, convolution property and frequency shift property.

(b) Prove that:

$$\int_{-\infty}^{\infty} x^2(t)dt = \int_{-\infty}^{\infty} x_e^2(t)dt + \int_{-\infty}^{\infty} x_0^2(t)dt$$

(c) If $x_1(n)$ & $x_2(n)$ are two periodic sequences given below, find the convolution between them.

$X_1(n) = (1,-2,0,1)$ & $x_2(n) = (2,1,1,0)$
↑ ↑

(d) Find initial & final value of

$$F(s) = \frac{0.8}{s(s^2 + 0.6s + 0.2)}.$$

(e) Find the Fourier transform of Signum function.

2. (a) $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 6y(t) = x(t)$

10 Find a) H(s) (b) h(t) and (c) step response of the system.

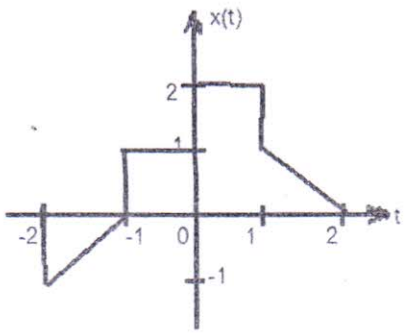
(b) A C.T. signal x(t) is given as follows: **10**

Sketch the following for this signal

i) x(4 - t/2)

ii) x(2t+1)

iii) x(t) . u(t)



3. (a) Find out the system response without using Laplace transform if input x(t) & impulse response h(t) are as follows: **10**

$x(t) = te^{-2t}u(t)$
$h(t) = u(t)$

(b) Check whether following signals are power or energy or neither signals. Find energy and power of signals. **6**

i. $X[n] = n \quad n \geq 0$

$0 \quad n < 0$

ii. $X(t) = Ae^{-5t}u(t)$

TURN OVER

(c) Determine whether signals are periodic or not. Find out fundamental period. 4

i. $X(t) = 2\cos\left(\frac{9\pi t}{2}\right)$

ii. $X[n] = \cos\frac{n\pi}{2} - \sin\frac{n\pi}{8} + 3\cos\left[\frac{n\pi}{4} + \frac{\pi}{3}\right]$

4. (a) Find Z.T. and R.O.C. of the following. 10

i. $X[n]=(0.6)^n u[n]+ 0.9^n u[n]$

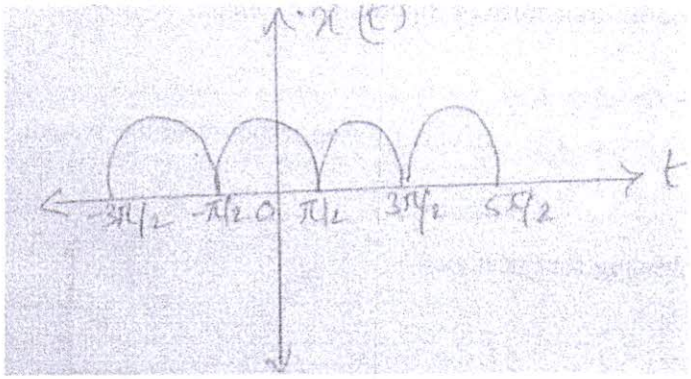
ii. $X[n]=(2/3)^n u[n+2]$

(b) Determine whether following systems are static or dynamic, linear or non-linear, time variant or invariant, causal or non causal & stable or unstable. 10

i. $y[n] = 2x(2^n)$

ii. $\frac{dy(t)}{dt} + t\,y(t) = x(t)$

5. (a) Find exponential form of Fourier series of following signal 10



(b) Find inverse Laplace transform for all possible ROCS. 10

i. $X(S) = \frac{5S-10}{9S^2-16}$

ii. $X(s) = \frac{s+3}{s^3+3s^2+6s+4}$

6. (a) Find out impulse response of 10

$$H[z] = \frac{5z^2}{(z-0.1)(z-0.5)}$$

(b) Find odd and even part of given signal. 04

$x(t) = (1+t^3)(\cos^3 10\,t)$

(c) State and prove Parseval's theorem. 06

Sem-V (CBSGS) / INST / Applications of Microcontroller -I / Nov-17

Q.P. Code: 23762

03 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) Draw and explain block diagram of Microprocessor.

b) Draw and explain PORT 0 structure of 8051 Microcontroller.

c) Write a assembly language program for addition of 38H and 2FH and also show the status of the CY, AC and P flag.

d) With XTAL = 11.0592 MHz, find TH1 value at baud rates 9600 and 2400.

2. a) Compare characteristics of RISC and CISC architecture. **08**

b) Write assembly program to convert packed BCD 29H to two ASCII numbers and place them in R2 and R6. **08**

c) State features of 8052 Microcontroller. **04**

3. a) Draw architecture of advanced 80151 microcontroller and state its features. **10**

b) Draw Interfacing of DAC with 8051 microcontroller and write an assembly language program to produce sine wave. **10**

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4. a) 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: **10**

SW = 0: send MUMBAI
SW = 1: send UNIVERSITY.

Assume XTAL = 11.0592 MHz, baud rate of 9600, 8-bit data, 1 stop bit.

b) Draw and explain Interrupt internal circuit diagram with its registers of 8051 Microcontroller. **10**

5. a) Write an 8051 C program to send letters 'R', 'S', and 'P' to the LCD using delays. **10**

b) The word "RAJIV" is to be burned in the flash ROM. Write a program to do this and to read this data into internal RAM. **10**

6. a) Interface 7-segment display with 8051 and write a program to display 0-9 counter with a predetermined delay. **10**

b) Explain implementation of Traffic Light Controller using 8051 microcontroller. **10**

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TE/Sem-V (CBSGS)/INST/Control System Design/Nov-17

Q. P. Code: 24358

Duration: 3 Hours **Max. Marks 80**

N.B.

1. **Q.1** is compulsory. Attempt **any three** from the remaining questions.
2. All questions carry equal marks.
3. Figures to the Right indicate full marks.
3. Assume suitable data if necessary

Q.1 Attempt **any four**

a. Define state transition matrix (STM). Write the properties of STM. **20**

b. Obtain the transfer function for the following system.

$$\begin{aligned} \dot{x} &= Ax + Bu \\ y &= Cx + Du \end{aligned}$$

c. What is lead compensator? Why it is required?

d. Construct the Vandermonde matrix M to diagonalize the matrix

$$F = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & -9 & -6 \end{bmatrix}$$

e. Define stabilizability and detectability of the system.

f. For the system

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

the desired pole locations are $-1.5 \pm 0.5j$. Check if the desired poles are on root locus or not.

Q.2 A. Check for the controllability and observability of the system, **10**

$$\begin{aligned} \dot{z}_1 &= z_2 \\ \dot{z}_2 &= 5z_1 + u_2 \\ \dot{z}_3 &= z_1 + 3z_3 + u_1 \end{aligned}$$

having the outputs $y_1 = z_1$ and $y_2 = z_2$.

B. Represent the following system into controllable canonical state representation. **10**

$$G(s) = \frac{s+4}{s^4 - 3s^3 - 15s^2 + 19s + 30}$$

Q.3 A. Design the lag compensator $G_c(s)$ using root-locus for the system in Figure 1 so as to achieve the velocity error constant of $50sec^{-1}$ without appreciably changing the original closed loop pole locations. **10**

B. Draw typical circuit diagram and corresponding transfer function for lag-lead compensator. Write the steps to design lag-lead compensator using Bode plot. **10**

Q.4 A. Design the state feedback control for the system 10

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & 1.5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

to place the poles at $-3, -4$.

B. Obtain $x(t)$ for the system 10

$$\dot{x} = \begin{bmatrix} 2 & 0 \\ 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

if initial condition is $x(0) = [1 \ \ 1]^{\mathsf{T}}$.

Q.5 A. Prove via linear transformation that state space representation of the system is not unique and eigen values of system matrix are invariant under linear transformation. 10

B. Explain with neat diagram Full order state observer. 10

Q.6 Write short notes on 20

A. Ziegler-Nichols method for PID controller tuning.

B. PD compensator.

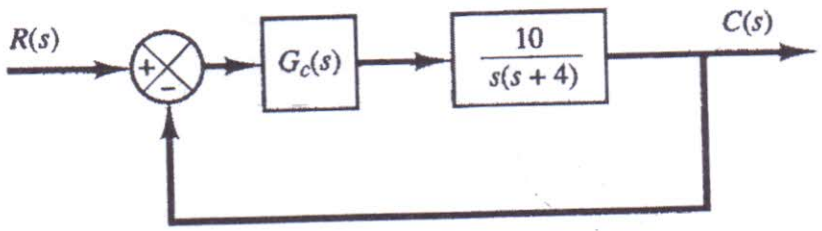

Figure 1:

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E/ Sem-V (CBSGS) / INST / Signal conditioning Circuits Design / NOV-2017.

Q.P. Code : 24936

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Attempt any 3 Questions from remaining 5 Questions.
3. Assume suitable data whenever necessary.

Q.1 Answer any 04 out of the 05 questions given below: **20**

a) Explain the working of Zero crossing detector with diagram.
b) Explain in brief, the concept of loading and method of reducing it.
c) Explain in brief, data acquisition system.
d) Draw and explain sample and hold circuit.
e) Explain the characteristics of digital data.

Q.2 a) Draw and explain 3 op-amp instrumentation amplifier, giving its applications. Explain any one application in detail. **10**

b) Explain with circuit diagram, the working of ideal integrator. Give the problems associated with it and show how it is overcome in practical integrator. **10**

Q.3 a) Give the advantages of precision rectifier over traditional diode rectifier. Explain with a circuit diagram the working of absolute value circuit using op-amp. **10**

b) Give the advantages of active filters over passive filters. Design a second order low pass Butterworth filter with a high cut-off frequency of 3 KHz. **10**

Q.4 a) Draw and explain, principle and working of RTD. What is the signal conditioning associated with it. **10**

b) Using an RTD with α = 0.0034 / ^{0}C and R = 100 Ω at 20^{0}C, design a bridge and op-amp circuit to provide 0 V to 10.0 V output for 20^{0}C to 100^{0}C. The RTD has P_D = 28 mW/^{0}C and maximum ΔT=0.05^{0}C **10**

Q.5 a) Design and explain the operation of Astable multivibrator using IC555. **10**

b) Draw and explain the signal conditioning circuit used in strain gauges. **10**

Q.6 Write short notes on (any four): **20**

a) Phase locked loops
b) SMPS
c) V to F Converter
d) Flash type ADC
e) All pass filter

Q.P. Code :20956

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Attempt any three questions from Q.No.2 to Q.No.6.
3. Draw suitable diagram wherever required.

Q.1 Attempt **any five**. 20

a. Explain air supply system with diagram.
b. Compare: Hydraulic, Pneumatic and electric system.
c. Explain pneumatic to electric converter.
d. Draw inherent characteristics of control valve.
e. Explain concept of RFID. Give suitable example.
f. Write a short note on: Alarm annunciator.

Q.2
a. Explain linear and rotary actuators used in pneumatic system with neat diagram. 10
b. Explain any speed control circuit used for hydraulic actuator. 10

Q.3
a. Draw and explain buoyancy transmitter with industrial applications. 10
b. How SMART transmitter works? Give applications of SMART transmitter. 10

Q.4
a. Give selection criterion of control valve. 10
b. What is need of valve positioner? Explain any type of valve positioner with diagram. 10

Q.5
a. List out various auxiliary process control components. Explain square root extractor in detail. 10
b. Give need of contactors. Explain working of contactors. 10

Q.6 Write a short note on: (**attempt any four**) 20

a. Control valve actuators
b. Volume boosters
c. Electro-mechanical relay
d. Four wire transmitter
e. Limit switches

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