TE. SEM V (EXTC) NOV. DEC. 2013

V-A4-II-Ex-13-E-79

RECD 02/12/13

Con. 6787-13. **LJ-11350**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of the remaining **six** questions.
(3) Assume **suitable data** wherever **required** and **justify** the **same**.

1. (a) A typical PCB substrate consists of Al_2O_3 with a relative dielectric constant of 10 and a loss tangent of 0·0004 at 10 GHz. Find the conductivity of substrate. **5**
   (b) Draw the lumped element circuit model for a transmission line. Derive the expression for voltage and current travelling waves. **5**
   (c) Explain current flow in Pn junction and give the expression for I_{diff} in terms of diffusion constant and Vdiff in terms of doping concentration. **5**
   (d) A lossless 50Ω microstrip line is terminated into a load with admittance of 0·05 mS. What additional impedance has to be placed in parallel with load to assure impedance of 50 Ω. **5**

2. (a) A short circuited 50 Ω transmission line section operated at 1 GHz and posseses a phase velocity of 75% of the speed of light. Use both the anlytical and the Smith chart approach to determine the shortest length required to obtian : **10**
      (i) 5·6 pF Capacitor
      (ii) 4·7 nH inductor.
   (b) Explain various terminations used in Microstrip transmission line. **10**

3. (a) Starting with the equation for normalized admittance :— **10**

$$y = g + jb = \frac{1 - \Gamma}{1 + \Gamma}$$

Prove that the circle equations for the Y-Smith chart are given b y the following two formulas :—

(i) For the constant conductance circle as $\left(\Gamma r + \frac{g}{g+1}\right)^2 + \Gamma i^2 = \left(\frac{1}{1+g}\right)^2$

(ii) For the constant susceptane circle as $(\Gamma r + 1)^2 + \left(\Gamma i + \frac{1}{b}\right)^2 = \left(\frac{1}{b}\right)^2$

   (b) Explain with the equivalent circuits the radio frequency behaviour of resistor, inductor and capacitor. **10**

4. (a) State and prove Kuroda's four identities. **10**
   (b) Expalin in brief the principle of operation of HEMT and RF FET along with their construction. **10**

[TURN OVER

5. (a) Design a prototype low pass butterworth filter that will provide atleast 20dB attenuation at the frequency of f = 2f 3dB. (Calculate order) **10**

   (b) What is Miller effect ? Show that :— **10**

$$C_{M1} = C_{cb}\left(1 - \frac{V_{ce}}{V_{be}}\right) \text{ on the i/p port.}$$

$$C_{M2} = C_{cb}\left(1 - \frac{V_{be}}{V_{ce}}\right) \text{ on the o/p port.}$$

6. (a) Derive expresion for internal, external and loaded quality factors for standard series and parallel resonant circuit. **10**

   (b) Explain the function of BJT in detail. **10**

7. Write short notes on :—

   (a) Butterworth filter **5**

   (b) Chip components **5**

   (c) Schottky contacts **5**

   (d) Richard's transformaiton **5**

TE (EXTC) Sem – V (Rev) 07/12/13

Signals and Systems.

59 Con-code 6 - JP

Con. 7041–13. **LJ–11392**

(3 Hours) **[Total Marks : 100**

i) Question No.1 is **compulsory**.
ii) Answer any **four** questions out of remaining **six** questions.
iii) Figure to the right indicates full marks.
iv) Illustrate the answers with sketches wherever required.

Q.1 a) Determine whether the following signals are energy or power signals? Calculate their energy or power. **20M**

(i) $x(n) = u(n)$ (ii) $x(t) = A \sin t$; $-\infty < t < \infty$

b) State & prove the following properties of Fourier transform.
(i)Time shifting (ii) Differentiation in time domain

c) Check whether following systems are linear or non-linear, Time invariant or time variant causal or non causal, static or dynamic .
(i) $y(t) = x(t) \cos 100\pi t$ (ii) $y(t) = x(t + 10) + x^2(t)$

d) Compare Discrete time Fourier transform & continuous time Fourier transform.

e) State and discuss the properties of region of convergence for Z-transform.

Q.2 a) Determine the exponential form of Fourier series representation of the signal shown in below figure 2 (a). **10M**
Hence determine the trigonometric form of Fourier series.

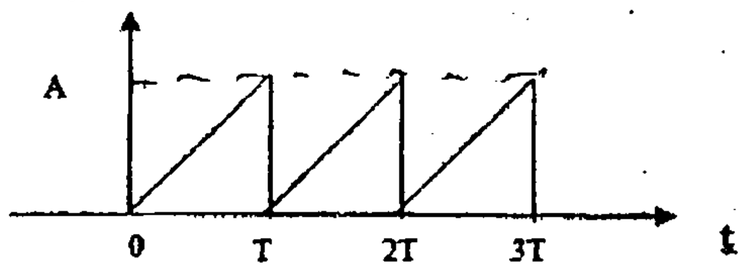

Figure 2 (a)

b) Determine whether following signals are periodic or non - periodic? If periodic find fundamental period **10M**

(i) $x(t) = \cos(t) + \sin(\sqrt{2}\, t)$ (iii) $x(n) = \cos\left(\frac{1}{2} n\right)$

(ii) $x(t) = \text{Sin}^2(t)$ (iv) $x(n) = \cos^2\left(\frac{\pi}{8} n\right)$

Q.3 a) The analog signal given below is sampled 600 samples per second **10M**
$x(t) = 2 \sin 480\pi t + 3 \sin 720\pi t$
Calculate:-
i) Minimum sampling rate to avoid aliasing.
ii) If the signal is sampled at the rate Fs = 200Hz, what is the discrete time signal after sampling.
iii) If the signal is sampled at the rate Fs = 75Hz, what is the discrete time signal obtained after sampling.

b) Determine the DT sequence associated with z-transform given below **10M**

i) $X(z) = \frac{1 - (1/2) z^{-1}}{1 + (1/2) z^{-1}}$; $|z| > 1/2$: ROC

ii) $X(z) = \frac{z^2 + z}{z^2 + 2z + 1}$; $|z| > 3$: ROC

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TE (ExTC) sem-V (Rev)

Signals & Systems.

61 Con-code 6 - JP

Con. 7041–LJ–11392–13.

Q.4 a) The transfer function of discrete time causal system is given by **10M**

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2\,z^{-1} - 0.15\,z^{-2}}$$

Draw cascade & parallel realization.

b) Obtain the convolution of **10M**

$x(t) = u(t)$ & $h(t) = 1$ for $-1 \le t \le 1$

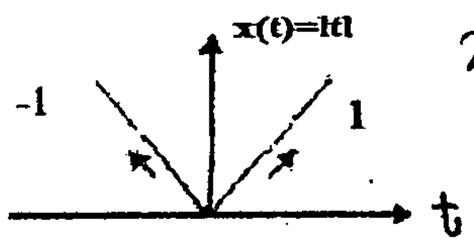
Q.5 a) Obtain the inverse Laplace transform of **10M**

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

b) Find the Fourier transform of **10M**

i) $e^{-2(t-1)}u(t - 1)$

ii)



x(t) = |t|

Q.6 a) Determine the impulse response of DT-LTI system described by the difference equation (for $n \ge 0$) **10M**

$y[n] - 1/2\ y[n - 1] = x[n] + 1/3\ x[n - 1]$

where all the initial conditions are zero.

b) A causal LTI system has transfer function $H(z) = H_1(z) \cdot H_2(z)$ **10M**

$$H_1(z) = \frac{1 - 0.2z^{-1}}{1 + 0.5z^{-1}} \quad \& \quad H_2(z) = \frac{1}{1 + 0.3z^{-1}}$$

i) If system is stable give ROC condition.
ii) Find the impulse response.
iii) Find system response if, $X(z) = \frac{1}{1 - 0 \cdot 2z^{-1}}$
iv) Draw pole-zero diagram.

Q.7) a) Using suitable method obtain the state transition matrix STM e^{At} for the system for the system matrix. **10M**

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

b) The transfer function of the system is given as **10M**

$$H(s) = \frac{s^2 + s + 5}{s^3 + 6s^2 + 8s + 4}$$

Obtain the state variable model.

12/12/13.

T.E (EXTC) Sem V
Principles of control systems

Ash4-D:\Data-53

Con. 7076-13. **LJ-11431**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question no. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) **Figures** to the **right indicate** full marks.
(4) Illustrate answers with sketches and graph, wherever required.
(5) Assume **suitable** data if necessary.

1. Answer the following :– **20**
   (a) Define sensitivity of a control system. How can we reduce the sensitivity of a closed loop system.
   (b) Explain Hurtvitz stability criterion with its disadvantages.
   (c) Define following terms related to second order system, subjected to a unit step input.
      (i) Rise time.
      (ii) Peak time.
      (iii) Peak overshoot.
      (iv) Delay time.
      (v) Setting time.
   (d) What are the advantages of a Nyguist Plot.

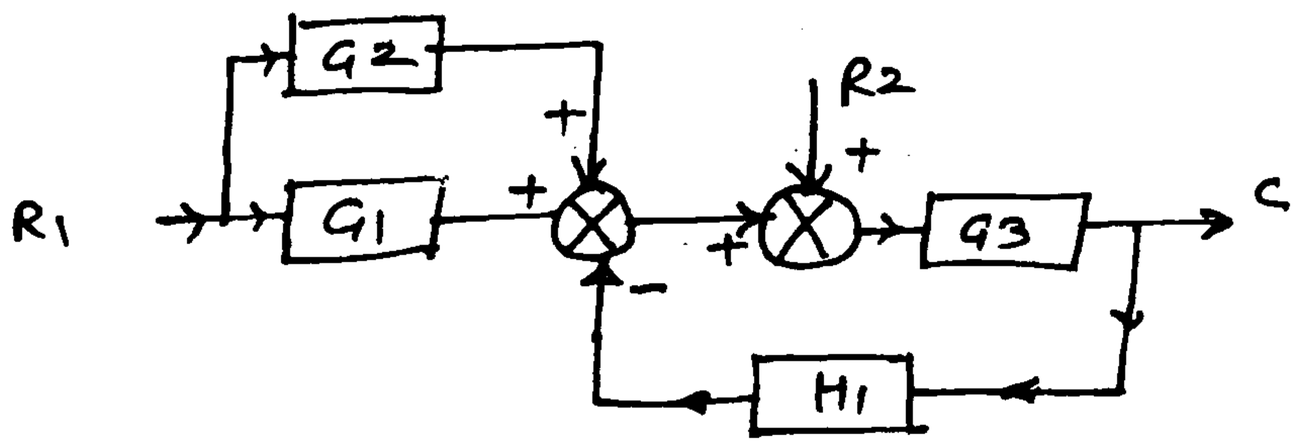
Assume suitable data

2. (a) If a second order control system has transfer function $F(s) = S^2+24S+9$. If a step input is applied to it, determine the time domain specifications. Also sketch the time response. **10**
   (b) Find the range ot 'k' to make the system stable for a unity feedback system. **10**

$$G(S) = \frac{K(S+20)}{(S+2)(S+3)}$$

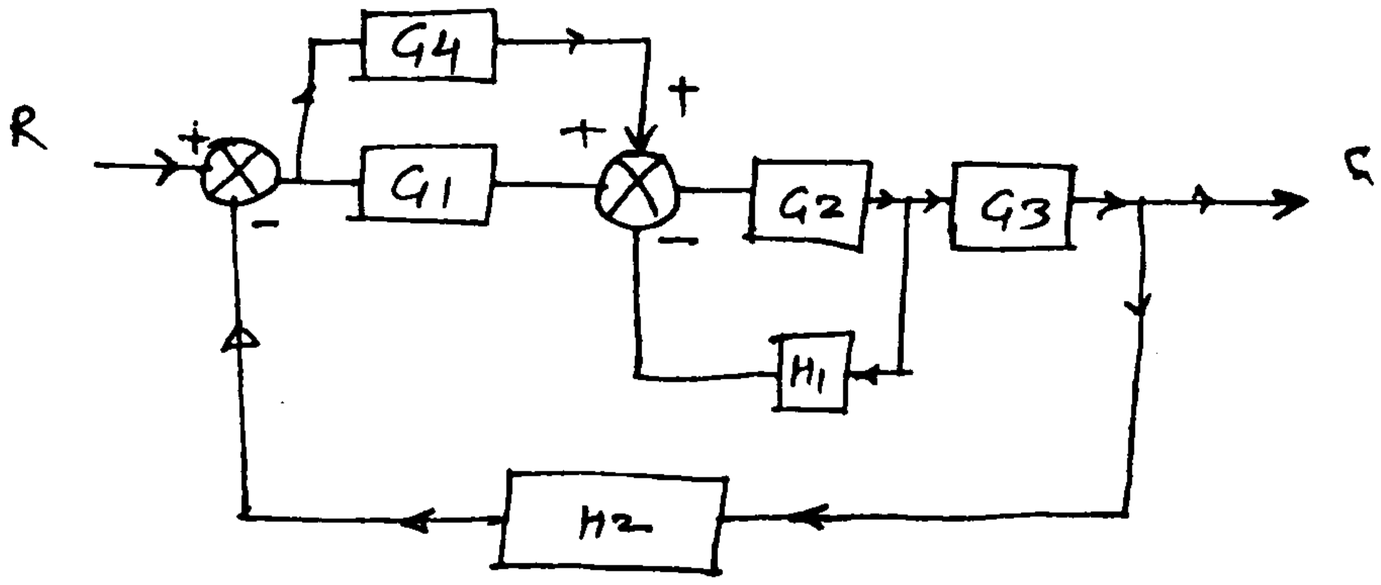
3. (a) Determine the transfer functions $\frac{C}{R1}$ and $\frac{C}{R2}$ from the given system below :– **10**

Also find C/R.



(b) Find the transfer function of the following system by using signal flow graph. **10**

TURN OVER



4. (a) Draw the complete root locus for the system :– $G(S)\,H(S) = \dfrac{K}{S(S+3)(S+6)}$ **10**

Obtain the value of k when $\xi = 0.6$ from root locus. Also determine the value of k for marginal stability and critical damping.

(b) For a unity feedback system :– $G(S) = \dfrac{200}{S(S+8)}$, and $r(t) = 2t$, Determine steady **10**

state error. If it is desired to reduce the existing error by 5%, find new value of gain of the system.

5. (a) A unity feedback system has a loop gain $G(S)\,H(S) = \dfrac{60}{(S+4)(S^2+2S+5)}$ **10**

Determine the system stability using Nyguist plot.

(b) Compare open loop control system and closed loop control system with at least 3 examples. **10**

6. (a) Use Bode plot to determine the frequency response of system, $H(S) = 1$ **10**

$$G(S) = \frac{80S^2}{(2S+1)\,(S+1)(0.2S+1)}$$

(b) A unity feedback control system has $G(S) = \dfrac{K}{(S+4)^3}$ Determine the range of **10**

value of k for system stability.

7. Write short notes on any **two :–** **20**

(a) Stepper motor constructions and its applications in control system.

(b) State variable model with an example.

(c) Error compensation techniques.

T.E. EXTC Sem V Oct - B

Syb. - RSA : 21/NOV/13

148 : 2nd – half 13 (a) – JP

Con. 6724–13. **LJ–11269**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data when **required** but justify the **same**.

1. (a) Define a strict – sense stationary (SSS) and wide-sense stationary (WSS) Random Process. **5**
(b) Show that the conditional probability satisfies the axioms of probability. **5**
(c) State and explain Total probability theorem and Baye's Theorem. **5**
(d) State Central limit theorem and give it's significance. **5**

2. (a) What is CDF of a Random variable ? State and prove the properties of Distribution functions. **10**
(b) It is known that the screws produced by a certain company will be defective with probability 0·01 independently to each other. The company sells the screws in the packages of 10 and offers a money-back guarantee that at most 1 of the 10 screws is defective. What proportion of packages sold must company replace ? **5**
(c) The probability of hitting an aircraft is 0·001 for each shot. How many shots should be fired so that the probability of hitting with two or more shots is above 0·95 ? **5**

3. (a) Define characteristic function of a Random variable. Prove that given the characteristics function the n^{th} moment is given by **10**

$$E[x^n] = \frac{1}{j^n} \frac{d^n}{dw^n} \phi_x(w) \Big/ w = 0.$$

(b) Suppose pdf of x, $f_x(x) = \frac{2x}{\pi^2}$, $0 < x < \pi$, and $Y = \sin x$. Determine the PDF of Y. **10**

4. (a) Find the normalization constant C and the marginal pdf's for the following joint pdf - **10**

$$f_{xy}(x, y) = \begin{cases} c\, e^{-x}\, e^{-y} & 0 \le y \le x < \infty \\ 0 & \text{elsewhere} \end{cases}$$

(b) Explain in brief :— **10**
(i) Poisson process
(ii) Gaussian process.

[TURN OVER

5. (a) Explain what is Random process. Define Ensemble mean, Auto correlation and Auto covaraiance of the process in terms of Indexed Random variables in usual Mathematical forms. **10**

   (b) Consider the Random phase Sinusoid given by $X(t) = A \cos(wt + \phi)$ where A and w are constants and $\phi \sim u\,[0 \cdot 2\pi]$ is a Random variable. Prove that Random phase sinusoid is Ergodic in both mean and Auto correlation. **10**

6. (a) Let $Z = X + Y$. Determine PDF of Z $f_z(z)$. **10**

   (b) A stationary process is given by $x(t) = 10 \cos [100t + \theta)$ where θ is a Random variable with uniform probability distribution in the Interval $[-\pi, \pi]$. Show that it is wide-sense stationary [WSS] process. **10**

7. (a) State and prove the Chapman-Kolmogorov equation. **10**

   (b) The transition probability matrix of Markov chain is – **10**

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 \cdot 5 & 0 \cdot 4 & 0 \cdot 1 \\ 0 \cdot 3 & 0 \cdot 4 & 0 \cdot 3 \\ 0 \cdot 2 & 0 \cdot 3 & 0 \cdot 5 \end{bmatrix} \end{array}$$

Find the limiting probabilities.

T.E. EXTC Sem V CBSGS Nov-13

Sub:- MPMC -I 27-11-13

6-11-13-DTP28-NK-12

Con. 6764-13. **LJ-11312**

(3 Hours) **[Total Marks : 100**

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

(2) Attempt any **four** questions out of the remaining **six** questions.

1. (a) Explain T states, Machine cycles and instruction cycles. **5**

(b) Why address and data bus are multiplexed? Explain how they demultiplexed in 8085. **5**

(c) Differentiate SJMP, AJMP and LJMP instructions of 8051. **5**

(d) Write assembly language program for 8051 to read the data from port lines P1.0 to P1.3 and P2.0 to P2.3, if data are equal then send FFH to PORT 3 else OOH. **5**

2. (a) Explain interrupt structure of 8085. **10**

(b) Explain internal memory organization of 8051 microcontroller. **10**

3. (a) Draw and explain timing diagram for instruction INR M. **10**

(b) Draw and explain the architecture of ARM processor. **10**

4. (a) Explain the control word register format of 8253. Write assembly language program for 8085 to generate a square wave of frequency 2 KHz using 8253. Assume 8253 clock frequency is 1 MHz. **10**

(b) Explain addressing modes of ARM processor. **10**

5. (a) Interface 8255 to 8085 using I/O mapped I/O technique. Write assembly language program to initialize 8255 as PORT A - input port, PORT B - output port in mode 1. **10**

[TURN OVER

(b) Calculate the time delay produced by the following subroutine. Assume crystal frequency of 8085 as 6 MHz. **10**

```
        PUSH PSW
        PUSH B
        LXI B, FFFDH
UP :    DCX B
        MOV A,C
        ORA B
        JNZ UP
        POP B
        POP PSW
        RET
```

6. (a) Write assembly language program to generate a reactangular waveform of frequency 1 KHz and 70% duty cycle at pin P1.1 using 8051. Assume 8051 microcontroller is operating at frequency 12 MHz. **10**

(b) Explain serial communication in 8085 system. **10**

7. Write short note on :- **20**

(a) Salient features of 89C51, 89C52, 89C2051 and 89C2052.

(b) ADC 0808 interfacing with 8051 microcontroller.

(c) PORT 1 internal structure of 8051.

(d) Memory Access instructions of ARM processor.

T.E. Sem-I EVS 18/12/2013.
ETRX, CMPN, IT, EXTC.

Con. 7101-13. **LJ-11450**

(2 Hours) **[Total Marks : 50**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from Question Nos. **2** to **7**.
(3) Draw **suitable** sketches wherever **required**.
(4) **Figure** to the **right** indicates **full** marks.

1. Answer any **five** of the following:– **10**
   (a) Explain the concept of food chain with suitable example.
   (b) What are the causes and effects of E-pollution?
   (c) Differentiate between : Renewable and Non-renewable energy resources.
   (d) What is sustainable development? What are its benefits?
   (e) Explain the term 'Hot Spots of Biodiversity'.
   (f) What are the functions of State Pollution Control Board.
   (g) Why thermal pollution is growing? How it can be controlled?

2. (a) Explain briefly the characteristic features of forest ecosystem. How forest ecosystem can be conserved? **5**
   (b) Why there is need for water conservation? Explain briefly how rain water harvesting can be carried out? **5**

3. (a) How marine pollution is caused? Explain adverse effects caused on account of it. **5**
   (b) What is disaster management? How these techniques can be implemented in the event of cyclone. **5**

4. (a) Explain briefly the salient features of Air Pollution Prevention and Control Act. **5**
   (b) Why global warming is taking place? What are the adverse effects produced by it? **5**

5. (a) What is Biodiversity? Explain the important values of biodiversity. **5**
   (b) How acid rain is formed? What adverse effects are produced on account of it. **5**

6. (a) What role is played by Information Technology to the field of human health and environment. **5**
   (b) Explain structural and functional aspects of an ecosystem. **5**

7. (a) What is solid waste? Explain the methods to control solid waste. **5**
   (b) List important air pollutants. What are their sources and how do they affect us? **5**
