S.E SEM III CBGS
30/11/15
ETRX, EXTC
AM- IV

QP Code : 5350

Duration: 3 Hours (REVISED COURSE) Total marks assigned to the paper:80

N.B:1) Q 1 is compulsory.

2) Attempt any three from the remaining.

Q 1: a) Find the extremal of $\int_{x_1}^{x_2}(y^2 - y'^2 - 2ycoshx)dx$ (5)

b) Find an orthonormal basis for the subspaces of R^3 by applying Gram-Schmidt process where S={(1,2,0)(0,3 1)} (5)

c) Show that eigen values of unitary matrix are of unit modulus. (5)

d) Evaluate $\int \frac{dz}{z^3(z+4)}$ *where* $|z| = 4$. (5)

Q2: a) Find the complete solution of $\int_{x_0}^{x_1}(2xy - y'^2)\,dx$ (6)

(b) Find the Eigen value and Eigen vectors of the matrix A^3 where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$ (6)

(c) Find expansion of $f(z) = \frac{1}{(1+z^2)(z+2)}$ indicating region of convergence. (8)

Q3: a) Verify Cayley Hamilton Theorem and find the value of A^{64} for the matrix A=$\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$. (6)

b) Using Cauchy's Residue Theorem evaluate $\int_{-\alpha}^{\infty} \frac{x^2}{x^6+1}dx$ (6)

c) Show that a closed curve 'C' of given fixed length (perimeter) which encloses maximum area is a circle. (8)

Q4: a) State and prove Cauchy-Schwartz inequality. Verify the inequality for vectors $u = (-4,2,1)$ *and* $v = (8,-4,-2)$ (6)

b) Reduce the Quadratic form $xy + yz + zx$ to diagonal form through congruent transformation.(6)

c) If $A = \begin{bmatrix} \frac{3}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{3}{2} \end{bmatrix}$ then find e^A *and* 4^A with the help of Modal matrix. (8)

Q5: a) Solve the boundary value problem $\int_0^1 (2xy + y^2 - y'^2)\,dx$, $0 \le x \le 1$, $y(0) = 0, y(1) = 0$ by Rayleigh - Ritz Method. (6)

[TURN OVER

MD-Con. 8620-15.

b) If $W = \{\propto: \propto \in R^n \text{ and } a_1 \geq 0\}$ a subset of $V = R^n$ with $\propto = (a_1, a_2 \ldots\ldots a_n)$ in R^n (n≥3). Show that W is not a subspace of V by giving suitable counter example. (6)

c) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is similar to diagonal matrix. Find the diagonalsing matrix and diagonal form. (8)

Q6: a) State and prove Cauchy's Integral Formula for the simply connected region and hence evaluate $\int \frac{z+6}{z^2-4} dz, \quad |z-2| = 5$ (6)

b) Show that $\int_0^{2\pi} \frac{\sin^2\theta}{a+b\cos\theta} d\theta = \frac{2\pi}{b^2}\left(a - \sqrt{a^2-b^2}\right), \ 0 < b < a.$ (6)

c) Find the Singular value decomposition of the following matrix $A = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$ (8)

++

EXTC
SE sem IV CBGS
Control system

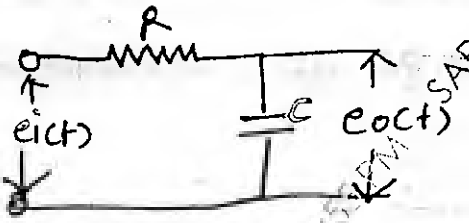
EXTC 22/12/15

QP Code : 5535

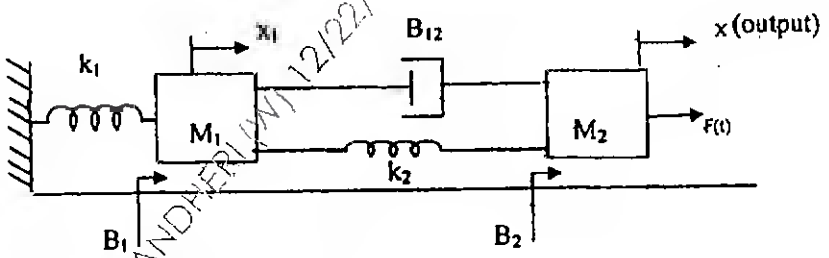
(3 Hours) [Total Marks :80

N.B. : (1) Question **No.1** is **compulsory**
(2) Attempt any **three** questions out of the remaining questions.
(3) Assume **data** whenever **necessary.**
(4) **Figures** to the **right** indicate **full** marks.

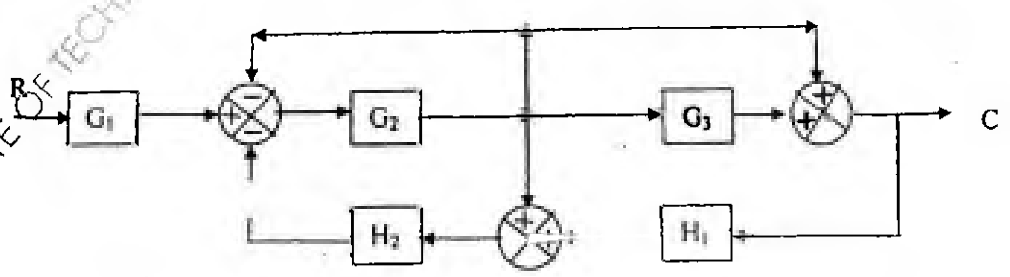
1. (a) Define rise time. 5
(b) Define gain margin and phase margin. 5
(c) What are the difficulities encountered in applying Routh stability criterion? 5
(d) Find out response of give system for a unit step I/P 5



2. (a) Obtain the transfer function of the mechanical systems shown in Fig. 11a (i). 10



(b) Draw a signal flow graph for the system shown in fig 11a (ii) and hence obtain the transfer function using Mason's gain formula. 10



[TURN OVER

3. (a) Derive the expression for step response of second-order under damped system. 10

(b) Find the impulse response of the second order system whose transfer function 10

$$G(s)=\frac{9}{(s^2+4s+9)}$$

4. (a) A unity feedback system is characterized by an open loop transfer function 10

$G(s)=\frac{K}{s(s+10)}$ Determine the gain K so that the system will have a damping ratio of 0.5. For this value of K determine settling time peak over shoot and time to peak over shoot for a unit step input.

(b) An unity feedback system is given as $G(s)=\frac{1}{s(s+1)}$. The input to the 10

system is described by $r(t) = 4 + 6t + 2t^2$. Find the generalized error coefficients and the steady state error.

5. (a) Sketch the Bedplate showing the magnitude in dB and phase angle in degrees as a function of log frequency for the transfer function given by 10

$$G(s)=\frac{10}{s(1+0.5s)(1+0.1s)}$$ and hence determine the gain margin and the phase margin of the system.

(b) Sketch the root locus for a unity feedback system with open loop transfer function $G(s)=\frac{K}{s(s^2+8s+32)}$. 10

6. (a) Using Routh-Hurwitz criterion for the unity feedback system with open loop transfer function $G(s)=\frac{K}{s(s+1)(s+2)(s+5)}$ find 10

(i) the range of k for stability
(ii) the value of k for marginally stable
(iii) the actual location of the closed loop poles when the system is marginally stable.

(b) Explain controllably and observably. 10

SE (SEM IV) (REV. 2012) (CBSGS) EXTC Dec-2015
Signals & Systems

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

QP Code : 5497

N.B.:

1. **Question no.1 is compulsory**
2. **Attempt any three questions out of the remaining five.**
3. **Assume suitable data wherever necessary.**

---

1. **(20)**

a) Determine the fundamental period of the following signals.

i) $x(t) = 2\cos\frac{2\pi t}{3} + 3\cos\frac{2\pi t}{7}$ ii) $x[n] = \cos^2\left[\frac{\pi}{4}n\right]$

b) Prove and explain time scaling and amplitude scaling property of Continuous time Fourier Transform.

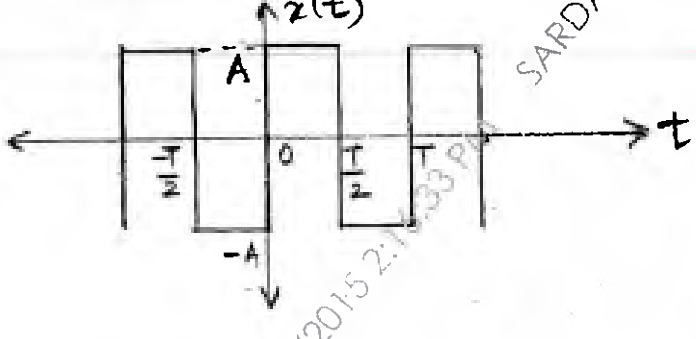
c) For the given system, determine whether it is, i) memory less, ii) causal, iii) time-invariant $y[n]=nx[n]$

d) Find out even and odd component of the following signal.

$x(t) = \cos^2\left(\frac{\pi t}{2}\right)$

2.

a) Determine the trigonometric form of Fourier Series of the waveform shown below. **(10)**



b) State duality property of Fourier Transform. If Fourier Transform of $e^{-t}u(t)$ is $\frac{1}{1+j\Omega}$, then find the Fourier Transform of $\frac{1}{1+t}$ using duality property. **(10)**

3.

a) Obtain inverse Laplace transform of the function. Write down and sketch possible ROCs. **(10)**

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

TURNOVER

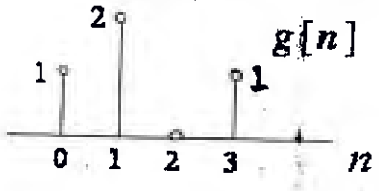
b) Using the z transform, solve the difference equation and find out impulse response. (10)

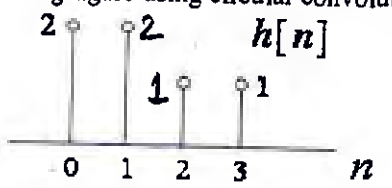
$$y[n]-2y[n-1]+y[n-2]=x[n]+3x[n-3]$$

4.

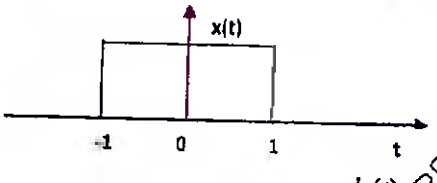
a) State and explain different properties of ROC of Z transform. (5)

b) Convolve the sequences shown in the following figure using circular convolution (5)





c) A continuos time signal is shown below. Sketch the following transformed versions of the signal. (10)



i) x(t-3) ii) -2x(t) iii) x(t-3)-2x(t) iv) $\frac{dx(t)}{dt}$

5.

a) Convolve $x[n]=\left(\frac{1}{3}\right)^n u[n]$ with $h[n]=\left(\frac{1}{2}\right)^n u[n]$ using convolution integral. (10)

b) A second order LTI system is described by $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=x(t)$. Determine the transfer function and the poles and zeros of the systems. Evaluate zero-state response to x(t)=u(t) (10)

6.

a) For the periodic signal x[n] given below find out Fourier series coefficient. (10)

$$x[n]=1+\sin\left(\frac{2\pi}{N}\right)n+3\cos\left(\frac{2\pi}{N}\right)n+\cos\left(\frac{4\pi}{N}n+\frac{\pi}{2}\right)$$

b) The input and impulse responses of continuous time system are given below. Find out output of the continuous time systems using appropriate method. (10)

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

S.E. EXTC (IV) (CBGS) 10/12/15
Wave Theory and Propagation

Q.P. Code : **5455**

(3 Hours) [Total Marks :80

N.B. : (1) Question No.1 is **compulsory**.
(2) Answer any **three** questions from the remaining **five** questions.
(3) Assume any suitable data wherever required.
(4) **Figures** to the right indicate **full** marks.

1. Answer any four of the following. 20
   (a) With regard to ionosphere discuss the following-
      i) E layer
      ii) Sporadic E layer
   (b) Give significance of boundary conditions for electric field.
   (c) Write integral form of Ampere's law and interpret the same.
   (d) What do you mean by depth of penetration?
   (e) Derive the boundary conditions for electric and magnetic field.

2. (a) Explain earth reflection on horizontally and vertically polarized wave. 10
   (b) Derive Maxwell's equation in point and integral form. 10

3. (a) Compare scalar and vector potential. 5
   (b) Derive wave equation for good dielectric medium. 5
   (c) A media has the following properties $\mu_r = 8$, $\varepsilon_r = 2$, $\sigma = 10^{-4}$ mho/m at 2GHz. Determine- 10
      (i) Attenuation Constant
      (ii) Attenuation Constant in dB
      (iii) Phase Constant
      (iv) Propagation Constant
      (v) Wavelength
      (vi) Phase Velocity
      (vii) Intrinsic Impedance
      (viii) Refractive Index
      (ix) Loss Tangent
      (x) Is the medium behaving like conductor or dielectric

4. (a) Derive an expression for magnetic field intensity due to finite long straight element. 10
   (b) State the Poynting Theorem and explain meaning of each term. 5
   (c) Derive wave equation in free space. 5

TURN OVER

5. (a) Obtain the reflection and transmission coefficient of a parallel polarized wave incident between a dielectric-dielectric boundary with an oblique incidence. 10

(b) Explain Super refraction and Tropospheric fading. 10

6. (a) What is virtual height of a layer? Why is it called so? Is it more than or less than the actual height of the layer? 5

(b) What is ionosphere? Which layers are peresent during day and night? Define critical frequency. 5

(c) Prove that static electric field is irrotational and static magnetic field is solenoidal. 10

SE | Sem IV | EXTC | CBGS | Microprocessor and peripherals 04/12/15

QP Code : 5413

(3 Hours) Total Marks: 80

Note: Q. 1 is compulsory and answer any 3 out of remaining questions.

Q1. A) Explain the function of following pins of microprocessor 8085. (5 Marks)

a) SOD/SID b) ALE c) HOLD

B) What are features of 80386 microprocessor? (5 Marks)

C) Explain interrupt pin of 8085 microprocessor. (5 Marks)

D) Differentiate between memory mapped I/O and I/O mapped I/O (5 Marks)

Q 2 a) Explain different addressing modes of 8086 microprocessors. (10 Marks)

b) What is 8087 math coprocessor? Explain method of its interfacing with 8086 microprocessor. (10 Marks)

Q 3) a) Describe the importance of DMA controller. Explain method of interfacing 8057 DMA controller with 8086 microprocessor (10 Marks)

b) What is data acquisition system? Explain 8086 based data acquisition system. (10 Marks)

Q4. Design 8086 microprocessor based system using minimum mode with the following specifications.

I) 8086 microprocessor working at 10 MHz
II) 64 kb EPROM using 16k devices
III) 32kb SRAM using 16k devices

Clearly show memory map with address range. Draw a neat schematic (20 Marks)

Q5.a) Write a program for 8086 microprocessor for arranging given numbers in ascending order and store the results in memory location from 08000H onwards (10 Marks)

b) Explain interrupt structure of 8086. (10 Marks)

Q 6 a) Explain the architecture of Pentium microprocessor. (10 Marks)

b) Explain the function of analog to digital converter 0809 and describe its interfacing method with 8086 microprocessor. (10 Marks)

S.E Sem IV (CBGS) EXTC. 23/11/15

AE – II

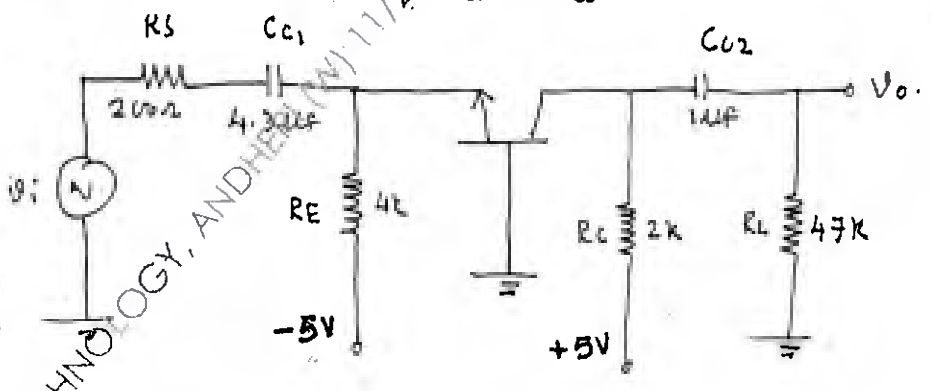
Q.P. Code : **5328**

(3 Hours) [Total Marks :80

N.B. : (1) Question **No.1** is **compulsory**
(2) **Solve** any **three** from remaining **five** questions.
(3) **Figure** to the **right** indicates **full marks**.
(4) Assume **suitable** data if **necessary**.

1. Solve Any **four**:- 20
   (a) In case of CE amplifier, Why does the bandwidth of amplifier decrease with increase in gain? Support the answer with relevent mathematical equation.
   (b) Instead of single Power Supply, why we use Dual power supply biasing for differential amplifier?
   (c) Why Efficiency of class A power Amplifier is less than class B.
   (d) What is the drawback of current mirror circuit using MOSFET? How it is overcome?
   (e) Why we prefer series voltage Regulator over shunt voltage Regulator? Explain in detail.

2. (a) The Parameters of transistor are $V_{BE} = 0.7V$ and $\beta = 100$, $V_A = 0V$, Determine 10
   (a) Q point of BJT
   (b) Time constant associated with C_{C1} and C_{C2}
   (c) Lower cut-off freq. due to C_{C1} and C_{C2}

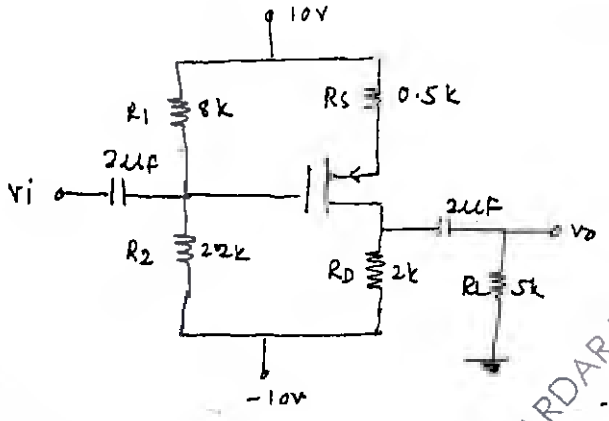


[TURN OVER

MD-Con. 8178-15.

(b) For the PMOS CS amplifier, transistor parameters are V_{TP} = -2V, Kp = 1 mA/V², λ = 0, Cgs = 15pf, Cgd = 3pf 10

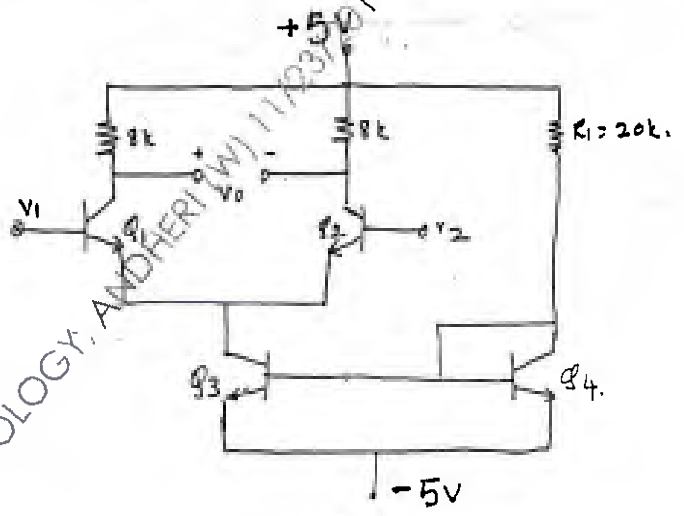
Determine (a) Equivalent Miller capacitance
(b) upper 3dB frequency



3. (a) For the given circuit, Determine 10

(i) Differential mode gain Ad
(ii) Common mode gain Ac
(iii) CMRR

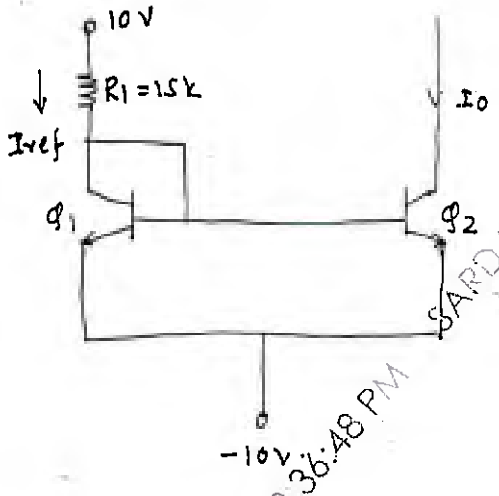
For BJT β = 100 V_{BE} = 0.7V, V_A = 100V.



[TURN OVER

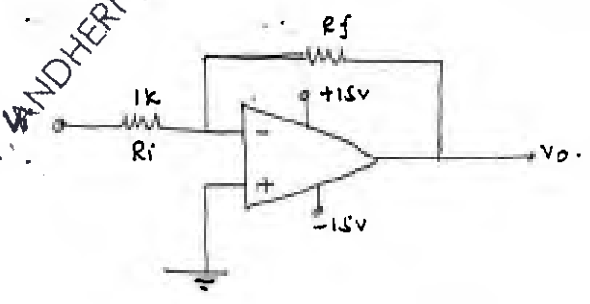
(b) Draw and explain the working of class A power amplifier (Transformer coupled). Derive the expression for efficiency. 10

4 (a) Draw and explain current mirror circuit using MOSFET, for the given circuit determine the value of I_{ref} and I_o. 10



(b) Draw the circuit diagram of darlington pair using BJT, and derive the expression for Av, Ai, Zi and Zo. 10

5. (a) For the given circuit, derive the equation for voltage gain A_f and find V_o for given cor 10



Vi	Vo	Ri	Rf
+1VDC	?	lK	10k
+1VDC	?	lK	100K
+1VDC	?	lk	1M

[TURN OVER

(b) Draw the circuit diagram of MOS differential amplifier and derive the expression for A_d, A_{cm} and CMRR. 10

6 Write short notes on (Attempt any **Four**.) 20

(a) High pass and low pass filter using OPAMP

(b) Cascode amplifier using BJT.

(c) Widlar current source using MOSFET.

(d) Transistor shunt voltage regulator

(e) High frequency hybrid-π model of BJT.
