SE - Sem IV / EXTC / CBSGS / MAY - June 2017

Subject - AE II

Date : 15-5-17

QP Code : 13153

(3 Hours) [Total Marks : 80

N.B. : (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions from the **remaining five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data if required and mention the same in the answer sheet.

1. Solve any **five** of the following :— 20
(a) Draw low pass first order active filter and derive expression for cut-off frequency.
(b) What is cross over distortion ? How to overcome the same.
(c) Determine unity gain band width for n-channel MOSFET with parameter $k_n = 0.25\ mA/V^2$, $V_{TN} = IV$, $\lambda = 0$, $C_{gd} = 0.05\ pf$, $C_{gs} = 0.25\ pf$. Assume MOSFET is biased at $V_{GS} = 3\ V$.
(d) Draw high frequency hybrid-π model and explain significance of each parameter.
(e) Why Cascode (CE-CB) amplifier provides more bandwidth as campared to CE Amplifier with equal gain.
(f) Implement $Vo = -(2V_1 + 5V_2 + 7V_3)$ using OpAmp.

2. (a) In common-emitter circuit as shown in **Fig. 2a**, the transistor parameters are $\beta = 120$, $V_{BE(on)} = 0.7\ V$, $V_A = 100\ V$, $C_\mu = 1\ pF$ and $f_T = 600\ MHz$. Determine : 10
(i) $C\pi$ and equivalent Miller Capacitance CM.
(ii) The higher cut-off frequency.
(iii) Small Signal midband voltage gain.

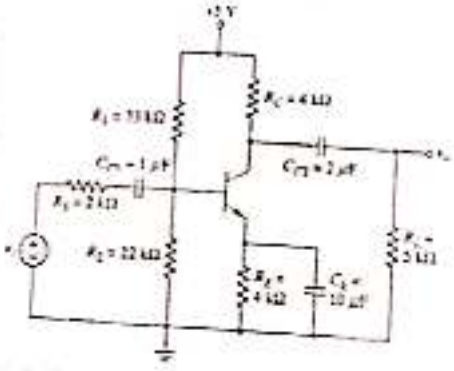


Fig. 2a

[TURN OVER

(b) For the circuit shown in **Fig. 2b** the transistor parameters are kn = 0.5 mA/V^2, $V_{TN} = 2$ V and $C_L = 5$ pF. Determine lower cut-off frequency and small signal voltage gain.

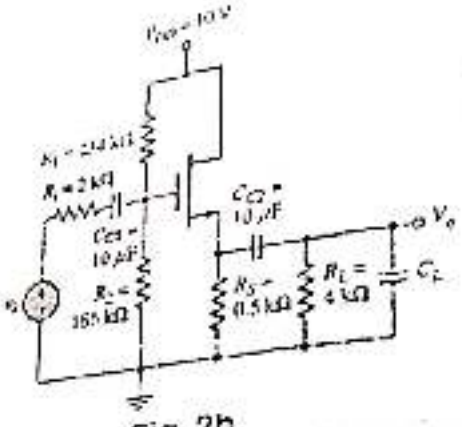


Fig. 2b

3. (a) Draw the circuit diagram of MOSFET based differential amplifier and derive expression for differential voltage gain, common mode gain and CMRR.

   (b) Draw circuit diagram of cascode amplifier using BJT and derive expression for voltage gain, in put resistance and output resistance.

4. (a) For the basic three transistor current source shown in **Fig. 4a**, the parameters are $V^+ = 9$V, $V^- = 0$V and $R_1 = 12$ K, for all transistors $V_{BE(on)} = 0.7$ V, $\beta = 75$ and $V_A = \infty$. Calculate value of each current shown in **Fig. 4a** i.e. I_{REF}, I_{C1}, I_{B1}, I_{B2}, I_{E3}, I_{B3}.

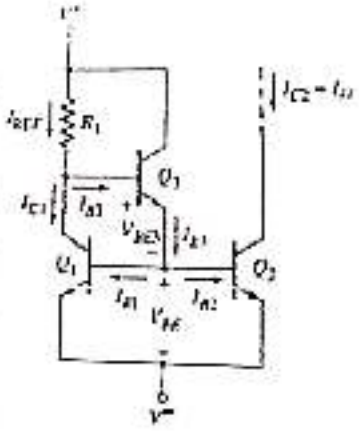


Fig. 4a

(b) Draw the circuit diagram and small signal equivalent circuit of Darlington configuration and derive expression for its input resistance and current gain.

5. (a) Draw circuit diagram of class B power amplifier. Explain its working with the help of waveforms and derive expression for power conversion efficiency. 10

(b) For the circuit shown in **Fig. 5b**, transistor parameters are $\beta = 100$, $V_{BE(on)} = 0.7$ V and $V_A = \infty$. 10

(i) I_{C1}, I_{C2}, I_E, V_{CE1} and V_{CE2}

(ii) Calculate differential voltage gain Ad for one sided output at the collector of Q_2.

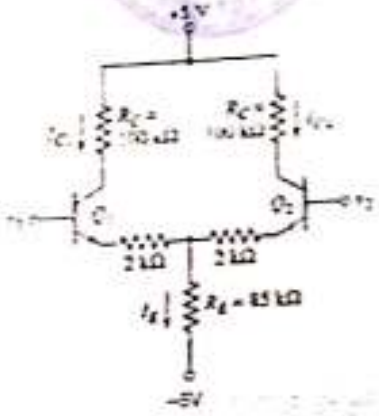


Fig. 5b

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

(a) Power MOSFET

(b) Transistorized shunt regulator

(c) Differentiator using OpAmp

(d) Wilson current source

(e) High frequency model of MOSFET.

EXTC/ AM IV / CBGS/ SEM IV / May 2017

EXTC/ AM IV /CBGS\ SEM IV / MAY 2017. 19/05/17

Q.P. Code : 11837

[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 from the remaining.

Q.1. a) Find the extremal of $\int_{x_0}^{x_1} \frac{1+y'^2}{y'^2}dx$ (5)

b) Is $(6,7,-4)$ a linear combination of $v_1 = (1,2,2), v_2 = (3,4,6)$ (5)

c) Check whether $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$ is derogatory or not. (5)

d) Evaluate $\int_0^{1+i} z^2 dz$, along the parabola $x = y^2$ (5)

Q.2. a) Show that the functional $\int_0^{\pi/2} \left[2xy + \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right]dt$, such that $x(0) = 0, x\left(\frac{\pi}{2}\right) = -1$, $y(0) = 0, y\left(\frac{\pi}{2}\right) = 1$ is stationary if $x=-\sin t$, $y=\sin t$. (6)

b) Evaluate $\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)}dx, a>0, b>0$ (6)

c) Reduce the quadratic form $x^2 - 2y^2 + 10z^2 - 10xy + 4xz - 2yz$ to canonical form and hence, find its rank, index and signature and value class. (8)

Q.3. a) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence find A^{-1} & A^4 (6)

b) Using Residue theorem evaluate $\int_C \frac{e^z}{z^4+\pi^4}dz$ where C is $|z|=4$. (6)

c) Find the singular value decomposition of $\begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$ (8)

Q.4: a) If $A = \begin{bmatrix} -1 & 4 \\ 2 & -1 \end{bmatrix}$, prove that 3tanA=Atan3 (6)

b) Find the sum of the residues at singular points of $f(z) = \frac{z-4}{z(z-1)(z-2)}$ (6)

EXTC / OLD / A & DIC / Sem IV / May 2017

19/05/17

Q.P. Code: 13362

[Time: - 3 Hours] [Marks: 100]

Please check whether you have got the right question paper.

N.B:
1. Question No. 1 is compulsory.
2. Solve any four questions from Question no 2 to Questions no 7.
3. Assume suitable data if necessary.
4. Figures to right indicate full marks.

Attempt any four 20

a) Explain current amplifier with grounded load.
b) Explain Flas ADC.
c) Explain Sample and Hold Circuit.
d) What are the universal Filter.
e) Explain the following term in relation to PLL:-
   i. Lock range
   ii. Capture range

a) Obtain the transfer function for KRC low pass filter and draw the circuit. Calculate the component value if fo=2kHz. And Q = 4. 10
b) Explain VCO IC 556 and its features. 10

a) What is Instrumentation amplifier, explain it with three opamp, and write down advantages and disadvantages of it. 10
b) Explain astable multivibrator with internal circuit and find expression for output frequency and duty cycle of IC 555. 10

a) Draw the internal block diagram of IC XR 2206 and explain it. 10
b) Draw the circuit of basic integrator using op-amp. Find expression for output voltage. Explain disadvantage of basic integrator. 10

a) Write VHDL code for a four bit up counter. 08
b) A fundamental-mode circuit is to have two inputs and a single output, which becomes '1' only upon the ocurrance of the last in the following sequence of input combination, otherwise z = o. 12
X1 x2 : 0 0 0 1 1 1 1 0 Construct primitive flow table

a) Draw the block diagram of internal architecture of XC 9500. 10
b) Explain inverting Schmitt trigger and the expression for the hysteresis voltage with transfer characteristics. 10

TURN OVER

7. Write short notes on:
   a) Explain FPGA
   b) Differentiate between static RAM and Dynamic RAM
   c) Log Amplifier

EXTC / Sem IV / CBSGS / MAY 19 / 25/5/19

T1424 / T1067 MICROPROCESSORS AND PERIPHERALS

Q.P.Code: 016749

(REVISED COURSE)

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

Note: 1) Q.1 is compulsory

2) Answer any 3 out of remaining questions

Q.1 (A) Explain the function of HOLD, HLDA , ALE, and AD0-AD7 pins of processor 8085. (5)

(B) Write features of 80286 microprocessor. (5)

(C) Explain memory segmentation of 8086. (5)

(D) Write control word of 8255 to initialize port A as input port, port B and C as output port, group A and B in mode 0 (5)

Q.2 a) What are different types of interrupt supported by 8086 and explain IVT. (10)

b) State purpose of interfacing 8259(PIC) to 8086. Explain interfacing of 8086(minimum mode) and 8259(single mode) (10)

Q.3 a) Draw and explain the interfacing of Math co-processor with 8086. (10)

b) Explain Minimum mode of 8086 microprocessor. Draw timing diagram for Read operation in Minimum mode. (10)

Q.4 a) Design an 8086 based system with following specifications. (10)

i. 8086 CPU working at 8MHz
ii. 32 KB EPROM using 16K device
iii. 32 KB SRAM using 16K device

b) Explain different modes of operation of 8257 DMA controller. (10)

Q.5 a) Write a programme to set up 8253 as square wave generator with 1 ms period if input frequency of 8253 is 1 Mz (10)

b) Explain in detail strobed input output mode of 8255. (10)

Q.6 a) Write a program for 8086 to find out the maximum number from an array of 10 numbers. (10)

b) Draw and explain interfacing of DAC 0808 with 8086 Microprocessor using 8255. Write a program to generate the square wave. (10)

SE SEM - IV EXTC CBGS 11/17.

Gnb - WT & P

T1424 / T1068 S.E.(ELECTRONICS & TELE COMMN ENGG)(SEM IV) (CBSGS) WAVE THEORY AND PROPAGATION

EXTC/ IV/ CBGS/ WT & P/ 16-DC-17

Q.P. Code: 16425

[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 out of the remaining five**
3. Draw neat diagrams wherever necessary.
4. Assume data, if missing, with justification
5. Figures to the Right indicate full marks.

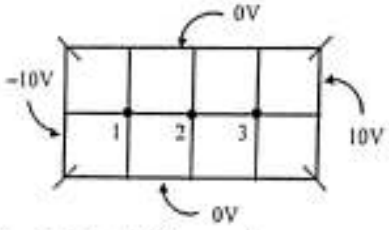
Q1. Attempt ANY FOUR out of the FIVE

(a) Compare parallel polarization and perpendicular polarization. **[05]**

(b) A zero potential reference is at r=10m and a point charge of Q=0.5 nC is placed at origin. Find potential at r=5m and r=15m. **[05]**

(c) Explain ducting effect. Under what conditions does this effect take place? **[05]**

(d) Determine the potential at the free nodes in the potential system of the following figure using Finite Difference Method (Band Matrix Method). **[05]**



(e) Explain the difference between conduction and displacement current with the aid of Maxwell's Equations **[05]**

Q2. (a) Derive boundary conditions for electric and magnetic field for a dielectric-dielectric interface stating its significance. **[8+2]**

(b) The plane z = 0 marks the boundary between free space and a dielectric medium with $\varepsilon r = 40$. The electric field next to the interface in free space is $\bar{E} = 13\bar{a}_x + 40\bar{a}_y + 50\bar{a}_z$ V/m. Determine the electric field on the other side of the interface. **[05]**

(c) Define Polarization of a wave. What are the different kinds of Polarization? State the conditions to achieve Circular polarization. **[2+1+2]**

Q3. (a) Why do we use Numerical Techniques to solve the problem? Compare FDM, FEM and MOM. **[3+2]**

TURN OVER

(b) Solve Laplace's equation [8]

$\nabla^2 V = 0,\ 0 \le x \le 1,\ 0 \le y \le 1$ with

$V(x,1) = 45x(1-x)$

$V(x,0) = V(0,y) = V(1,y) = 0$

Assume mesh size as 0.5.

(c) Obtain reflection coefficient and transmission coefficient of perpendicularly polarized wave incident on a dielectric-dielectric boundary with oblique incidence. Define the Brewster angle for this case. [8+2]

Q4. (a) Derive the relation between MUF and skip distance [5]

(b) If a high frequency communication link is to be established between two points on the earth 2000 km away, and the reflection region of the ionosphere is at height of 200 km and has critical frequency of 5 MHz, calculate MUF for the given path. [5]

(c) Circular loop conductor carrying current of 1A is placed in the xy-plane centred at origin. Find expression for the magnetic field intensity at any point on the $z-$axis. [10]

Q5. (a) Define loss tangent? How does it classify lossless dielectrics, lossy dielectric and good conductor? [2+3]

(b) Derive wave equation for free space [5]

(c) Four like charges of 40 μC each are placed at four corners of a square. The square diagonal is 12m. Find the force on 200 μC charge located at 5m above the centre of the square. [10]

Q6. (a) Find the force due to two point charges Q_1=4 mC and Q_2=2 mC located at A(3,2,-1) and on a charge Q_3=20 nC located at C(0, 3, 1). [5]

(b) Define skin depth. Some unknown material has a conductivity of 10^6 mho/m and a permeability of 4π x 10^-7 H/m. Calculate the skin depth for the material at 1 GHz. [5]

(c) Explain the formation of inversion layer in troposphere. [5]

(d) Explain the working of an Electromagnetic Pump. [5]

EXTC/ Sem IV/ CBSGS/ S&S/ 07/06/17

T1424 / T1069 SIGNALS AND SYSTEMS

Q.P. Code :11966

[Time: 3 Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B:
1. Question No.1 is compulsory.
2. Solve any THREE from the remaining FIVE questions.
3. Assume suitable data if required.

Q.1 a) What is cross correlation and auto correlation of the system. 20

b) Determine the even and odd part of the following continuous time signals.
   i) $x(t) = \sin 2t + \cos 2t + \sin t \cos 2t$
   ii) $x(t) = e^{-t} u(t)$

c) Determine the Laplace transform of the given signals:-

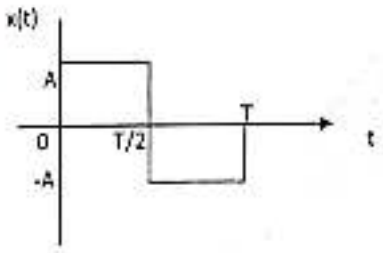


Fig.(a)

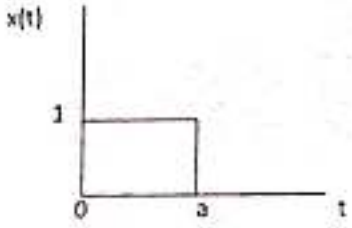


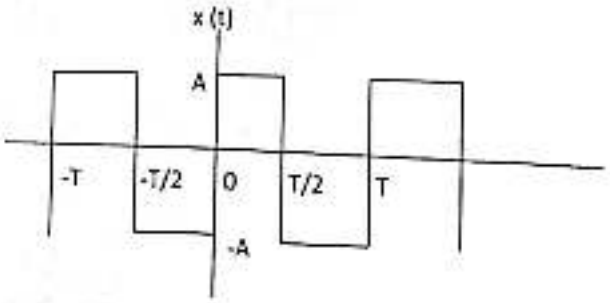
Fig.(b)

d) Determine whether the given systems are linear or non linear.
   i) $y(t) = x^2(t)$
   ii) $y(t) = e^x(t)$

e) Justify the following with Fourier series,
   i) Odd functions only have sine terms and even function have no sine terms

2 a) Prove the following properties of Fourier Transform. 10
   i) Time shifting ii) Frequency Scaling iii) Time Convolution iv) Time Scaling

b) Determine the Fourier series of the following signal shown:- 10



Q.P. Code :11966

Q.3 a) Find the transfer function, impulse response and step response of a Continuous time LTI system, also sketch the impulse and step response.

$$\frac{dy(t)}{dt} + 2y(t) = 3x(t)$$

b) An LTI system is described by the equation:-
$y[n] = x[n] + 0.8\,x[n-1] + 0.8x[n-2] - 0.49\,y[n-2]$
Determine the transfer function of the system. Sketch the poles & zeros of the z-plane.

Q.4 a) Perform circular convolution of the two sequences by using tabular Array and by using Metrics method
$x_1[n] = \{2,1,2,1\}$ and $x_2[n] = \{1,2,3,4\}$
↑ ↑

b) Solve the difference equation for a given system using Z-transform.
$y[n] - 3y[n-1] - 4y[n-2] = x[n] + 2x[n-1]$

Q.5 a) Explain Gibbs phenomena, also explain the condition necessary for convergence for Fourier series.

b) Determine the power and energy of the following continuous time signals:-

i) $x(t) = e^{-2t}u(t)$ ii) $x(t) = e^{j(2t+\frac{\pi}{4})}$

c) Find the inverse Laplace transform of:-
$X(S) = 4/(S+2)(S+4)$ if the ROC is
i) $-2 > \text{Re}\{s\} > -4$ ii) $\text{Re}\{s\} < -4$ ii) $\text{Re}\{s\} > -2$

Q.6 a) Determine the inverse Z –transform of the following function:-
i) $X(Z) = 1/(1-1.5\,Z^{-1} + 0.5\,Z^{-2})$
ii) $X(Z) = Z^2/(Z^2 - Z + 0.5)$

b) Determine the convolution of the following signals using Z-transform,
$x_1[n] = n\,u[n]$
$x_2[n] = 2^n\,u[n-1]$

EXTC / CBGS / IV / CS / 13/06/2017

T1424 / T1070 CONTROL SYSTEMS

Q.P. Code :11981

(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 if necessary.
(4) Figures to the right indicate full marks.

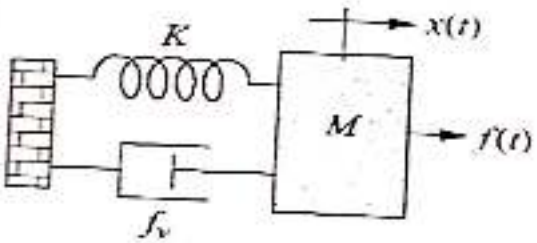
1. Attempt **any four** questions. **20**

a) Define absolute, relative and robust stability of the system
b) What is optimal control? Explain different performance measures used for optimal control problem.
c) Explain algorithm for applying Routh's stability criterion.
d) Write a closed form expression for e^{At} if

$$A = \begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix}$$

e) Explain Mason's gain formula.

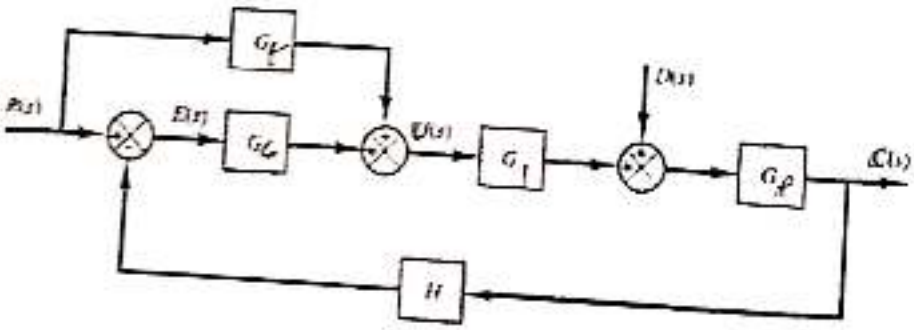
2. a) Find the transfer function X(s) / F(s) for the system given below **10**



b) Sketch the root locus for the given system **10**

$$G(s)H(s) = \frac{s+3}{s^2+s+2}$$

3. a) Obtain transfer functions C(s)/R(s) and C(s)/D(s) of the system shown in following figure **10**



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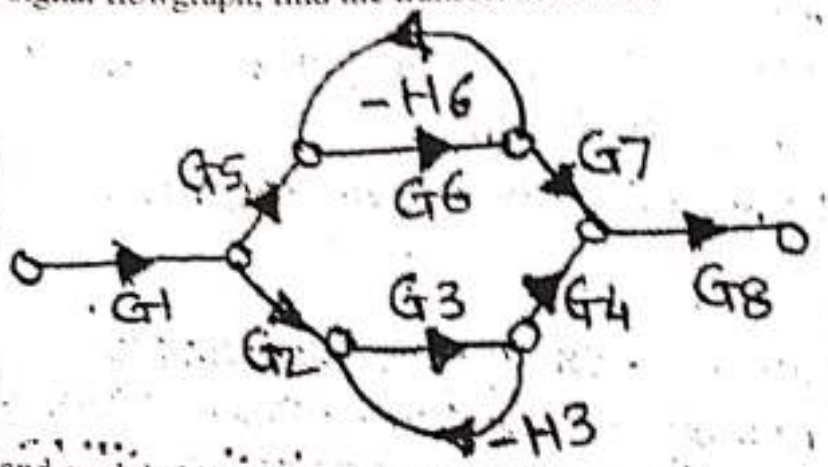
b) Obtain a state-space model of the following system. 10

$$G(s) = \frac{1}{(s+1)(0.2s+1)(s+10)}$$

4. a) For the signal flowgraph, find the transfer function. 10



b) Draw and explain block diagram of Adaptive control systems. 10

5. a) Draw the Bode Diagram for the transfer function. 10

$$G(s) = \frac{30(s+10)}{s^2+3s+50}$$

b) Consider a unity-feedback system whose open-loop transfer function is 10

$$G(s) = \frac{Ke^{-0.8s}}{s+1}$$

using the Nyquist plot, determine the critical value of K for stability.

6. a) For the given the transfer function , find Tp, %MP, Ts and Tr. 10

$$G(s) = \frac{100}{s^2+15s+100}$$

b) Comment on Controllability and observability for the given state space representation. 10

$$\dot{x} = \begin{bmatrix} -2 & 1 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u; \quad y = [0 \quad 1]x$$

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