AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBSGS **Branch:** EXTC **SEM:** IV

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- IV	ETS401		✓	02
2	Analog Electronics-II	ETC402		✓	02
3	Microprocessors & Peripherals	ETC403		✓	02
4	Wave Theory And Propagation	ETC404		✓	02
5	Signals And Systems	ETC405		✓	02
6	Control Systems	ETC406		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

10+5

SE- sem-IV- CBSGS- Extc/Electrical 13/5/19

Paper / Subject Code: 39002 / APPLIED MATHEMATICS - IV

Duration: 3 Hours Marks: 80

N.B: a) Question number 1 is compulsory

b) Solve any three from the remaining.

c) All the question carry equal marks

1. a) Find the extremal of $\int_0^{\pi} \frac{1+y^2}{y'^2}dx$ subject to $y(0)=0, y(\pi)=0$. [5]

b) Using Cauchy's Schwartz Inequality, show that $(a\cos\theta + b\sin\theta)^2 \leq a^2+b^2$, Where 'a' and 'b' are real. [5]

c) Show that Eigen values of Hermitian matrix are real. [5]

d) Evaluate $\int (z^2 - 2\bar{z} + 1)\,dz$ over a closed circle $x^2+y^2=2$. [5]

2. a) Find the extremal $\int_{x_1}^{x_2}(y^2 - y'^2 - 2y\cosh x)dx$ [6]

b) Find the Eigen values and Eigen Vectors of the matrix A^2+3I, where [6]

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

c) Obtain all possible expansion of $f(z) = \frac{1}{z^2(z-1)(z+2)}$ about $z=0$ indicating region of convergence. [8]

3. a) Verify Cayley - Hamilton Theorem for $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & -2 \\ -2 & 0 & 1 \end{bmatrix}$ and find A^{-1}. [6]

b) b) Using Residue theorem evaluate $\int \frac{e^z}{z^2+\pi^2}dz$ where C is $|z|=4$. [6]

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

4. a) Find an orthonormal basis for the subspace of R^3 by applying Gram-Schmidt process, where $u_1=(1,0,0), u_2=(3,7,-2), u_3=(0,4,1)$. [6]

b) Find A^{50} for the matrix $A = \begin{bmatrix} 4 & 3 \\ 7 & 8 \end{bmatrix}$ [6]

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c) Reduce the Quadratic Form $xy + yz + zx$ to normal form by congruent transformation. [8]

5. a) Using Rayleigh-Ritz Method, find an approximate solution to the extremal problem $\int_0^1 (y^2 + 2yx - y'^2)dx, \quad y(0) = 0, \ y(1) = 0.$ [6]

b) Determine whether the set $V = \{(x, y, z): x = 1, y = 0 \text{ or } z = 0\}$ is a subspace of R^3 [6]

c) Show that the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diogonable.Also find the transforming matrix and diagonal matrix. [8]

6. a) Using Cauchy's Residue Theorem, evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ [6]

b) Evaluate $\int_{1-i}^{2+i} (2x + 1 + iy)dz$ along the straight line joining $A(1, -1)$ and $B(2,1)$ [6]

c) Find the singular value decomposition of the matrix A= $\begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$ [8]

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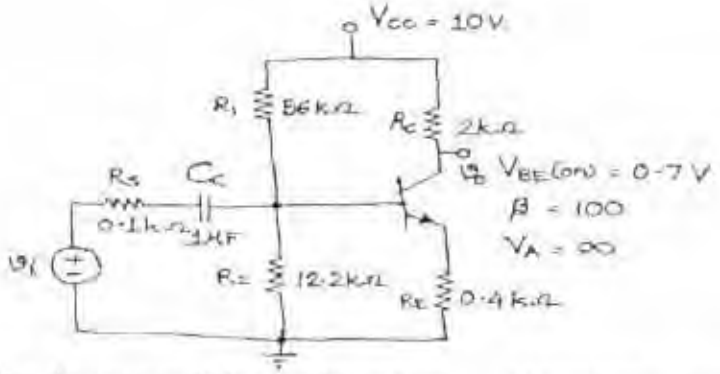
(3 Hours) [Total Marks: 80]

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

Q.1 Attempt any 5 questions [20]
a) List the characteristics of an ideal OpAmp and compare it with practical ones
b) Compare power BJTs and power MOSFETS
c) What is crossover distortion in power Amplifer. How it is overcome?
d) Which type of biasing technique is used to bias Integrated Circuit and why?
e) Draw the high frequency hybrid –pi equivalent circuit of a BJT and define the various components in the model.
f) Explain line regulation and load regulation of voltage regulator. Draw load and line regulation characteristics of ideal and practical voltage regulator.

Q.2 a) Determine the corner frequency and maximum gain of a bipolar common emitter circuit with an input coupling capacitor. [10]



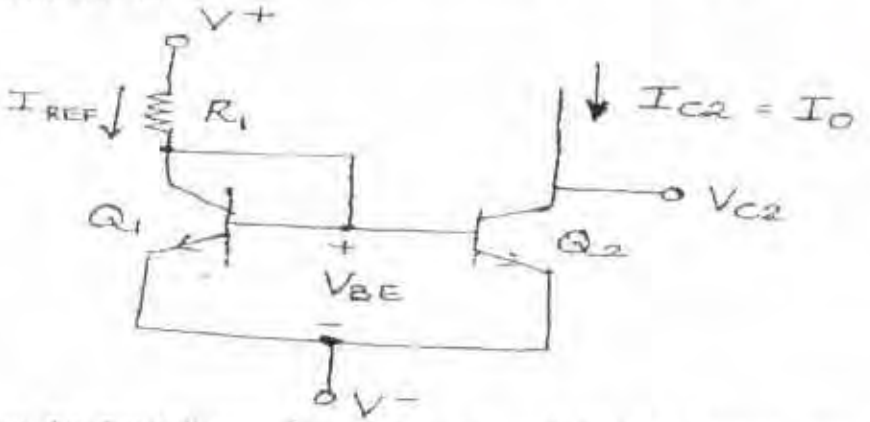
b) Determine the unity-gain bandwidth of N-channel MOSFET with parameters K =0.25 mA/ V², Vin= 1V, λ =0, Cgd = 0.04pF, Cgs = 0.2 pF, V_{GS} = 3V. If a 10 kl load is connected to the output between drain and source determine the Miller capacitance and cut off frequency. [10]

Q.3 a) For the circuit shown in fig 3 (a),transistor parameters are Kn=1mA/V², Vin = 0.7V ,Cgs = 2Pf ,Cgd =.2pF and λ = 0 .Find the miller capacitance , mid band voltage gain and upper cut off frequency. [10]

b) Draw the circuit diagram of MOSFET based differential amplifier and derive the expressions for differential voltage gain , common mode gain and CMRR. [10]

Q.4 a) Draw the circuit diagram and small signal equivalent circuit for a Darlington pair configuration . Derive the expression for its input resistance and overall current gain. [10]

b) Determine I, and Io for the two transistor current source. The circuit parameters 4 are V^+=10V, V^-=0V, R_1 = 15 kΩ and transistor parameters are V_{BE}(on) = 0.7V, β=75, and V_A =∞ . [10]



Q.5 a) Draw the circuit diagram for transformer coupled class A power amplifier . Also draw ac and dc load lines for the same. Derive expression for power conversion efficiency. [10]

b) Draw the circuit diagram for a summing amplifier and determine the expression of output voltage Vo. in terms of the input voltages V_1,V_2, and V_3, and the resistances used in the circuit. If it is desired to have V_o = - ($4V_1$+$7V_2$+$9V_3$) find suitable values of these resistances. [10]

Q.6 Short notes on: (Attempt any four) [20]

a) Power MOSFET
b) Transistorized Shunt Regulator
c) High pass and Low pass filter using OPAMP.
d) Class AB power amplifier
e) Wilson current source

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55 sem-IV – CBSGS – EXTC 12/5/17

Paper / Subject Code: 39203 / MICROPROCESSORES AND PERIPHERALS

Q.P.Code: 24739

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

Note:
1. **Question No. 1 is compulsory.**
2. **Out of remaining questions, attempt any three questions.**
3. **Assume suitable additional data if required.**
4. **Figures in brackets on the right hand side indicate full marks.**

1. (A) Explain interrupt pins of 8085. **(05)**

   (B) Explain in brief about programmable interrupt controller 8259. **(05)**

   (C) Explain advantages of memory segmentation of 8086. **(05)**

   (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. **(05)**

2. (A) Explain minimum mode of 8086 microprocessor. Draw timing diagram for read operation in minimum mode. **(10)**

   (B) Write a program to set up 8253 as square wave generator with 1 ms period if input frequency of 8253 is 1 MHz. **(10)**

3. (A) Draw and explain interfacing of DAC 0808 with 8086 microprocessor using 8255. Write a program to generate square wave. **(10)**

   (B) Explain 8086 interrupt structure. **(10)**

4. (A) Describe in brief and compare architecture of 80286 and 80486 microprocessor. **(10)**

   (B) Explain Modes of 8254 Timer/Counter peripheral IC with the help of timing diagram. **(10)**

5. (A) Draw and Explain interfacing of Math co-processor with 8086. **(10)**

   (B) Explain addressing modes of 8086 microprocessor **(10)**

6. (A) Explain different modes of operation of 8257 DMA controller. **(10)**

   (B) Discuss the functions of general purpose registers of 8086. Explain the function of each register and instruction support for these function. **(10)**

(3 Hours) (Total Marks : 80)

N. B. : 1. Question No. 1 is compulsory.
2. Attempt **any three** out of the remaining **five**.
3. Assume suitable data, wherever **necessary** and **justify** the same.
4. **Figures** to the **right** indicate **full marks**.

1. A) Compare MOM, FEM and FDM. (5)

B) Given the potential $V = 2x^2y - 5z$ (V) and a point P (-4, 3, 6), find (2+2+1)
a) Electric field intensity at P
b) Electric flux density at P
c) Volume charge density at P

C) State the Maxwell's equations for good dielectric in integral and point form. Also state their significance. (5)

D) With the help of neat schematic diagram, explain the working of an Electromagnetic Pump. (5)

E) Explain Super refraction. (5)

2. A) Two extensive homogeneous isotropic dielectrics meet on plane $z = 0$. (5+5)
For $z > 0$, $\varepsilon_{r1} = 4$ and for $z < 0$, $\varepsilon_{r2} = 3$.
A uniform electric field $\vec{E}_1 = 5\hat{a}_x - 2\hat{a}_y + 3\hat{a}_z$ (kV/m) exists for $z \geq 0$. Find,
a) $\vec{E}_2$ for $z \leq 0$.
b) The angles E_1 and E_2 make with the interface.

B) State Poynting theorem. Derive its final expression and explain the meaning of each term. (2+5+3)

3. A) What is ionosphere? Describe its various layers. Which layers are present during day and night time? Where maximum attenuation of electromagnetic waves takes place inside the ionosphere? (10)

B) State and derive FRISS transmission equation. (10)

4. A) Determine the potential at the free nodes in the potential system of Fig.1. using Finite Difference Method (Band Matrix Method). (10)

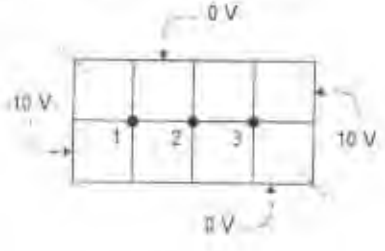

Fig.1.

B) Derive Helmholtz equations for Magnetic field in free space. (5)

C) For the normal incidence, determine the amplitudes of reflected and transmitted $\vec{E}$ and $\vec{H}$ at interface of two regions at $z = 0$. (5)

Given: Incident $E_i = 1.5 \times 10^{-3}$ (V/m); $\varepsilon_{r1} = 8.5$; $\mu_{r1} = 1$; $\sigma_1 = 0$. Second region is free space.

5. A) Explain formation of duct and condition for duct propagation. (10)

B) Obtain an expression for MUF in terms of d, H and f_c. (5+5)

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

6. A) Explain the formation of inversion layer in troposphere. (5)

B) Define critical frequency as a measure of ionospheric propagation and determine critical frequency for reflection at vertical incidence if the maximum value of electron density is 1.24×10^6 per CC. (2+3)

C) Four like charges of 30 μC each are located at four corners of a square, the diagonal of which measures 8 m. Find the force on 150 μC charge located at the center of square. (10)

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(6)

SE-sem-IV – CBSGS – EXTC

Paper / Subject Code: 39205 / SIGNALS AND SYSTEMS

29/5/19

(3 Hours) [Total Marks: 80]

N.B.:
1. Question No.1 is compulsory.
2. Attempt any three questions out of the remaining five.
3. Assume suitable data wherever necessary.

Q1 Answer the following 20

a) Determine discrete time Fourier series of $x(n) = \cos 2(\frac{\pi}{6} n)$

b) Explain in brief Region of convergence (ROC) for Laplace transform.

c) Test the causality of the following system.

1) $y(t) = x(t) - x(t-1)$ 2) $y(t) = x(t) + 3x(t+4)$

d) Sketch signal $e^{-t} u(t)$ and determine power and energy of signal

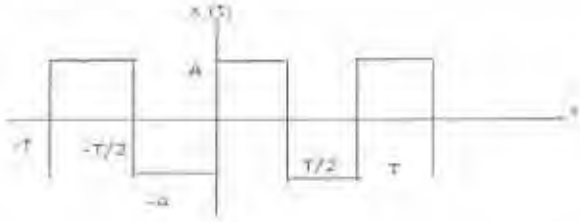
e) State and prove linearity property of Z-transform

Q2. a) Obtain bilateral inverse Laplace transform of the function: 10

$X(s) = \frac{3s+7}{(s^2-2s-3)}$

Find ROC of $Re(s) > 3$

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



Q3. a) Compute the convolution $y(n) = x(n) * h(n)$ using tabulation method 10

Where $x(n) = \{ 1, 1, 0, 1, 1 \}$ and $h(n) = \{ 1, -2, -3, 4 \}$

b) Determine the Fourier transform of following continuous time domain signal 10

i) $x(t) = 1 - t^2$; for $|t| < 1$

$= 0$; for $|t| > 1$

Q4. a) A stable system has input x (t) and output y (t). Determine transfer function and Impulse response h (t) by using Laplace transform. 10

$x(t) = e^{-2t} u(t)$; $y(t) = -2 e^{-t} u(t) + 2 e^{-3t} u(t)$

b) State and prove following properties of Fourier transform. 10

(i) Time shifting property

(ii) Time Reversal Property

Q5. a) An LTI system is described by the equation: 10

$y(n) = x(n) + 0.8\, x(n-1) + 0.8\, x(n-2) - 0.49\, y(n-2)$, determine the transfer function of the system and also sketch the poles and zeros on the z-plane.

b) Obtain and sketch the impulse response of the shift invariant system described by $y(n) = 0.4\,x(n) + x(n-1) + 0.6\,x(n-2) + x(n-3) + 0.4\,x(n-4)$ 10

Q6. a) Using Z- transform, determine the response of the LTI system with impulse response, $h(n) = \{1, -1, 1\}$, for an input $x(n) = \{-2, 3, 1\}$ 10

b) Explain Gibbs Phenomenon 05

c) List the properties of ROC for Z- transform. 05

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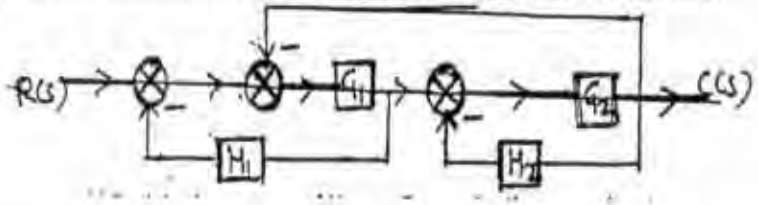
4/6/19

Time: 3 Hours **Marks: 80**

NB: 1Question no.1 is compulsory.
2 Attempt any 3 question from remaining questions.
3 Assume suitable data if necessary.
4 Figures to the right indicates full marks.

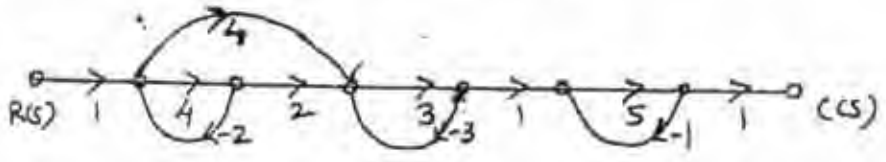
1) a) Explain Masons gain formula. 5
b) Define gain margin and phase margin. 5
c) Compare lead compensator and lag compensator. 5
d) Differentiate open loop and closed loop control system. 5

2) a) Obtain transfer function using block diagram reduction rule. 10



b) Explain the concept of Neuro –Fuzzy adaptive control system Explain one method of adaptive control. 10

3) a) Determine the C(s)/R(s) of the signal flow graph 10



b) Sketch the root locus for the given system 10
G(s) H(s) =k/s(s+3) (s+5)

4) a) Explain controllability and observability analysis of LTI system using suitable examples. 10
b) Examine the observability of the system 10

$$A=\begin{bmatrix}0 & 0 & 0\\ 1 & 0 & -3\\ 0 & 1 & -4\end{bmatrix} \qquad B=\begin{bmatrix}40\\ 10\\ 0\end{bmatrix} \qquad C=\begin{bmatrix}0 & 0 & 1\end{bmatrix}$$

5) a) unity feedback system has 10

$$G(s) = \frac{40\,(s+2)}{s(s+1)(s+4)}$$

Determine the type of the system, all error coefficients and error for ramp input with magnitude 4

b) For 10

$$G(s)\,H(s) = \frac{k}{s(s+1)(s+2)(s+5)}$$

using Routh- Hurwitz criterion determine range of k for stability and value of k for marginally stable system.

6 a) Sketch Bode plot for 10

$G(s) = k/s(s+0.5)(s+0.1)$

Determine value of k to obtain phase margin 30^0 and gain margin 12dB.

b) Explain correlation between time and frequency domain specification. 10

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