



Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2022-23/

Date: 25/01/23

School: SoET-REV. C-SCHEME 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	Engineering Mathematics- IV	ETS401		✓	
2	Microcontroller	ECC402		✓	
3	Linear Integrated Circuits	ECC403		✓	
4	Signals & Systems	ECC404		✓	
5	Principles of Communication Engineering	ECC405		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
 Librarian, AIKTC

8/12/22

3:30pm

ET-R-19

Duration: 3 hours

Sem-IV = CBCS-KT

Max. Marks: 80

N.B. (1) Question No. 1 is **COMPULSORY**.

(2) Answer **ANY THREE** questions from Q.2 to Q.6.

(3) Use of Statistical Tables permitted.

(4) Figures to right indicate full marks.

Q 1

- a. Evaluate the complex line Integral $\int_0^{1+i} (x - y + ix^2) dz$ along the straight line from $z=0$ to $z=1+i$ 5
- b. Find a vector orthogonal to $u=(-6, 4, 2)$ $v=(3, 1, 5)$ 5
- c. The equations of lines of regressions are $2x+3y+8=0$ and $x+2y-5=0$, find means of x and y and coefficient of line of regression between x and y 5
- d. Let W be the set of 2×2 matrices of the form $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ where a and b are real numbers, Show that W is a subspace of space V of all 2×2 matrices. 5

Q 2

Find the Spearman's rank coefficient correlation of the following data 6

a.

X	32	55	49	60	43	37	43	49	10	20
Y	40	30	70	20	30	50	72	60	45	25

b. Find the extremal of $\int_{x_1}^{x_2} \frac{1+y^2}{y'^2} dx$ 6

Obtain Taylor and Laurent series expansion about $z=0$ of function 8

c. $f(z) = \frac{z-1}{z^2-2z-3}$ indicating regions of convergence

Q. 3

a. A continuous random variable has probability density function as $f(x) = kx^2$ $0 \leq x \leq 2$, find k , mean and $P(0.2 < x < 0.5)$ 6

b. $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-3)} dz$ where C is the circle i. $|z|=1$ ii. $|z|=4$ 6

c. Reduce the quadratic form to canonical form, find its rank and signature $21x_1^2 + 11x_2^2 + 2x_3^2 - 30x_1x_2 + 12x_1x_3 - 8x_3x_2$ 8

- Q 4**
- a. Using Gram-Schmidt process, construct, an orthonormal basis of $(1, 1, 1), (-1, 1, 0)$ and $(1, 2, 1)$ in R^3 have Euclidian inner product 6
 - b. Find the probability that at most 4 defective bulbs will be found in a box of 200 bulbs, if it is known that 2% of the bulbs are defective 6
 - c. By Rayleigh -Ritz method, Solve the boundary value problem $y''+y+x=0$ $0 < x < 1$ $y(0)=y(1)=0$ 8

- Q 5** Ten students got the following percentage of marks in mathematics and statistics 6

a.

Maths	78	36	98	25	75	82	90	62	65	39
Stats	84	51	91	60	68	62	86	58	53	47

Calculate the coefficient of correlation.

- b. In a normal distribution 7% of the items are below 35 and 89% of the items are below 63. Find the mean and standard deviation 6
 - c. Find the extremal of $\int_{x_1}^{x_2} (y''^2 - y^2 + x^2) dx$ 8
- Q 6**
- a. Verify Cauchy -Schwartz inequality for $u=(1, 2, 4)$ and $v= (-3, 2, 5)$ 6
 - b. Evaluate $\oint_C \frac{\sin^6 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ where C is a circle $|z|=2$ 6
 - c. Find Singular value decomposition of $\begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$ 8

Sem - IV - KT - CBCS



Duration: 3 Hours

[Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required, and state it clearly.

- 1 Attempt any **FOUR** [20]
 a Compare Harvard and Von Neumann architecture.
 b Explain cache memory.
 c Compare microprocessor and microcontroller.
 d List the features of ARM7.
 e List the features of ATMEGA 328P.
- 2 a Explain addressing modes of 8051 with one example each. [10]
 b Differentiate between: i) Static and Dynamic RAM. ii) Paging and segmentation. [10]
- 3 a Explain with diagram Interfacing of electric kettle operating on 230V/ 5A to 8051 microcontroller. Write a program to make it ON and OFF depending on the status of bit, with an address 09H. [10]
 b Explain exceptions handling in ARM7 with reference to exception entry, return and exception priorities. [10]
- 4 a Explain serial communication in 8051 with the help of SCON register. [10]
 b Explain the concepts of program counter, stack and stack pointer. [10]
- 5 a What are the factors to consider while selecting microcontroller for a given application. [10]
 b Explain in detail with diagrams ports of microcontroller 8051. [10]
- 6 a Write an 8051 program to convert hexadecimal number stored in location 20H to unpacked decimal. Store the result at 21H, 22H and 23H. [10]
 b Explain ARMs programmers' model with neat diagram. [10]

30 pm

ET - R-19

14/12/22

Time: 3 hours

Sem - IV - CBCS - 19 - KT
C-19

Max. Marks: 80

Instructions:

- Question No. 1 is compulsory
- Solve any 3 questions from the remaining 5
- Figures to the right indicate full marks
- Assume suitable data if necessary and mention the same in the answer sheet

	Marks
Q1. Attempt any 4	
a) List the ideal characteristics of Operational amplifier and give the practical values of Op-Amp IC 741.	5
b) Draw a neat circuit diagram for voltage to current converter with grounded load. Derive its output current expression.	5
c) Differentiate between Inverting and Non-Inverting Comparator.	5
d) Explain the functional block diagram of Timer IC 555.	5
e) With the help of a functional block diagram explain the working of a Three terminal fixed voltage regulator.	5
f) Draw the block diagram of Voltage Controlled Oscillator and explain its working.	5
Q2a) Draw a neat circuit of an instrumentation amplifier using 3-Op-Amps & derive its output equation.	10
Q2b) What are the limitations of an ideal differentiator using op-amp? Draw the circuit diagram of a practical differentiator and explain how it overcomes the limitations.	10
Q3a) With help of neat circuit diagram and voltage transfer characteristics explain the working of a non-inverting Schmitt trigger.	10
Q3b) Design an astable multivibrator having an output frequency of 1 kHz with a duty cycle of 50% using IC 555. Assume $C = 0.01 \mu\text{F}$.	10
Q4a) Design a voltage regulator using 723 to deliver an output voltage of 15 V and load current up to 50 mA.	10
Q4b) Draw the functional block diagram of IC 565 and explain its application as FSK demodulator.	10
Q5a) Draw a neat circuit diagram of an inverting summing amplifier using op-amp to obtain the expression for its output voltage as $V_O = -(V_1 + V_2 + V_3)$, where V_1, V_2, V_3 are input voltages.	10
Q5b) With the help of a neat diagram explain the working of Wein bridge oscillator using op amp. Derive the expression for its frequency of oscillation. What are the values of R & C if its frequency of oscillation is 5 kHz?	10
Q6a) With the help of a neat diagram and wave forms at appropriate points in the circuit explain the working of square and triangular waveform generator using op amps.	10
Q6b) What is Pulse Width Modulation? With the help of a neat circuit diagram and waveforms at trigger input, control voltage pin, across the timing capacitor and at the output, explain the working of IC 555 as Pulse Width Modulator.	10

2:30 pm

Sem-IV - ECEs - KT ET (R-19)

16/12/22

(Time: 3 Hours)

[Total Marks: 80]

- N.B. : (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of remaining five.
 (3) All questions carry equal marks.
 (4) Assume Suitable data, if required and state it clearly.

Q1. Answer any 4 questions from the given questions: 20

- a. Explain the application of Signals and System in Multimedia Processing.
 b. Find the fundamental period of the signal

$$x(t) = \sin\left(\frac{2\pi}{6}t\right) - \cos(\pi t)$$

- c. Test the given system for linearity, causality, stability, memory and time variant.

$$y(t) = x(t^2)$$

- d. Find $x(-2t)$ and $x(3t+2)$

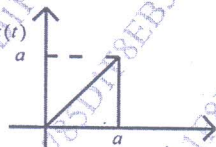


Fig. 1

- e. Explain the conditions for the existence of Fourier transform
 f. If system matrix $A = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix}$ find the state transition matrix.

Q2.a. Sketch the following signals for the given signal shown in Fig. 2 10

- a) $x(-t)$
 b) $x(2t+5)$
 c) $x(2t)$
 d) $x(t/2)$
 e) $-2x(t)$

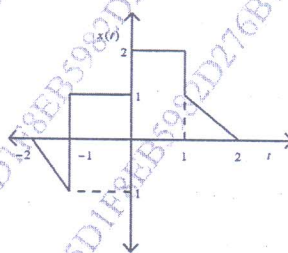


Fig. 2

- b. Using unilateral Laplace transform find the output of the system given by

$$\frac{d^3}{dt^3}y(t) + 6\frac{d^2}{dt^2}y(t) + 11\frac{d}{dt}y(t) + 6y(t) = x(t); \text{ where } x(t) = e^{-4t}u(t) \text{ and } y(0^-) = 1,$$

$$\left. \frac{dy(t)}{dt} \right|_{t=0^-} = 1, \quad \left. \frac{d^2y(t)}{dt^2} \right|_{t=0^-} = 1,$$

Q3.a. Find inverse Z Transform of X(z),

$$X(z) = \frac{z^2 + 2z + 1}{z^2 - \frac{3}{2}z + \frac{1}{2}}$$

b. Given DT sequence:

$$x(n) = 0.4\delta(n+2) + 0.2\delta(n+1) + 0.1\delta(n) + 0.2\delta(n-1) + 0.4\delta(n-2)$$

Determine the following;

- i. $X(e^{j\omega})$
- ii. $|X(e^{j\omega})|$
- iii. $\text{phase}\{X(e^{j\omega})\}$
- iv. $\int_0^{2\pi} |X(e^{j\omega})|^2$

Q4.a. Determine the state model of the system governed by the equation

$$y[n] = -2y[n-1] + 3y[n-2] + 0.5y[n-3] + 2x[n] + 1.5x[n-1] + 1.5x[n-2] + 4x[n-3]$$

- b. Find the Fourier transform of $x(t) = \begin{cases} \cos \pi t & ; -\frac{1}{2} \leq t \leq \frac{1}{2} \\ 0 & ; \text{otherwise} \end{cases}$
- i. From the definition of Fourier transform
 - ii. Using the convolution theorem of Fourier transform

Q5.a. Determine DTFS for the sequence $x(n) = \cos^2((\pi/8)n)$

- b.
- i. Find Laplace transform of $\frac{d}{dt} \sin(t) u(t)$.
 - ii. Find the Z Transform of signal $\cos(\omega_0 n) u[n]$

c. Find the canonic (direct form II) realization of $H(z) = \frac{1 - (\frac{1}{4})z^{-1} - (\frac{1}{2})z^{-2}}{1 + (\frac{1}{4})z^{-1} - (\frac{1}{8})z^{-2}}$

Q6. Answer the following.

- a. Find the autocorrelation function $R_{xx}(\tau)$ of sine wave signal
- $$x(t) = A \sin(\omega_0 t + \varphi), \omega_0 = \frac{2\pi}{T}$$
- b. Explain the concept ROC in Z-Transform and Laplace Transform.
- c. Discuss application of signals in Control system

ET (A-19)

19/12/22

30pm

Sem-IV-CBCS-KT

Duration: 3hrs

[Max Marks:80]

- N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any **FOUR** [20]
a Explain the necessity of de-emphasis and pre-emphasis
b Compare AM and FM.
c What is aliasing? How it can be avoided?
d A transmitter radiates 9kW of power with carrier unmodulated and 10.125 kW when modulated. Calculate the depth of modulation.
e List the advantages of pulse modulation over continuous modulation schemes.
- 2 a Explain indirect FM transmitter. [10]
b Draw a neat block diagram of a superheterodyne radio receiver and explain each block in detail. [10]
- 3 a What are the different methods for SSB generation? Explain any one in detail. [10]
b Explain the balanced slope detector with the help of a schematic diagram. [10]
- 4 a State and prove sampling theorem for low pass bandlimited signal. [10]
b With the help of suitable waveforms explain the generation and detection of PPM [10]
- 5 a Draw and explain the FDM transmitter & receiver block diagram along with its applications. [10]
b With the help of a block diagram explain the concept of PCM. [10]
- 6 a Explain in detail the balanced modulator with suitable expressions and waveforms [10]
b i) Write a note on Delta and adaptive delta modulation [10]
ii) Explain VSB in broadcast television.
