



BRAIN TEASER ACADEMY

Electronic Fields and Waves

Time Allowed: 2½ Hours

Max. Marks : 50

Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section - A: (Short Answer Type Questions)

(10 x 1 = 10 Marks)

1.
 - a. State Coulomb's Law and describe its significance in electrostatics.
 - b. What is the Poynting Theorem, and what does it describe in electromagnetic theory?
 - c. What is Faraday Rotation?
 - d. Two point charges, $+5 \mu\text{C}$ and $-3 \mu\text{C}$, are separated by a distance of 2 meters. Calculate the electric force between them using Coulomb's law.
 - e. Describe the Poynting vector and its role in Poynting's theorem. What does the Poynting vector represent physically?
 - f. Write all the four Maxwell's equations in differential and integral form.
 - g. Define the terms "phase velocity" and "group velocity".
 - h. What does the term "magnetic flux" represent in the context of magnetic fields and surfaces?
 - i. Which of Maxwell's Equations describes how magnetic fields are generated by electric currents and changing electric fields?
 - j. Describe the concept of group velocity, and explain its importance in wavepacket propagation.

Section-B: (Medium Answer Type Questions)

(4 x 5 = 20 Marks)

2.
 - a.
 - i. Twelve equal charges, q , are situated at the corners of a regular 12-sided polygon (for instance, one on each numeral of a clock face). What is the net force on a test charge Q at the center?
 - ii. Suppose one of the 12 q 's is removed (the one at "6 o'clock"). What is the force on Q ? Explain.
 - b. Describe the relationship between the electric field, magnetic field, and the direction of wave propagation in an electromagnetic wave. How do these fields interact?

c. Explain the concept of a plane wave and its mathematical representation. How does a plane wave differ in a lossless medium compared to a lossy medium?

d. Calculate the reflection and transmission coefficients for a plane wave incident on the interface between a lossless medium and a lossy medium. Explain the physical significance of these coefficients.

Section-C: (Long Answer Type Questions)

(2 x 10 = 20 Marks)

3.
 - a. A plane electromagnetic wave has an electric field amplitude of 100 V/m and a magnetic field amplitude of 0.4 T. Calculate the intensity of the wave, and determine the power carried by the wave through a given area. Apply the Poynting theorem in your calculations.
 - b. Derive the Wave Equation for a Plane Wave in a Lossless Medium
 - c. For an electromagnetic wave with oblique incidence at a conducting boundary, derive the expressions for the reflection coefficient (R) and the transmission coefficient (T).
 - d. Derive the Biot-Savart law and provide an example of its application to calculate the magnetic field at a point.

B.E/B.Tech 4th SEMESTER (Electronics & Communication Engineering)
Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)

OOPS in Java

Time Allowed : 2½ Hours

Max. Marks : 50
Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section - A: [Short Answer Type Questions]

(10 x 1 = 10 Marks)

1.
 - a. What is the difference between machine-code and byte-code?
 - b. What is typecasting?
 - c. Does Java have a default copy constructor?
 - d. List two uses of *super* keyword in JAVA?
 - e. Can we have a *try* block without a *catch* block in Java?
 - f. List two ways of declaring a string in Java?
 - g. List the different states a thread can go through in its lifetime?
 - h. Does importing a package in Java import sub-packages as well?
 - i. Does Java Applet require the existence of the Java Virtual Machine (JVM)?
 - j. What are the various components of the JDBC?

Section-B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.
 - a. Explain in detail how Java is a portable language across machines and platforms?
 - b. What is Inner Class? Write a program to implement inner class?
 - c. Using a java program illustrate the concept and use of *Runnable* interface.
 - d. Write a program to copy the contents of one file to another using stream class.

Section-C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.
 - a. What is the difference between *method overloading* and *method overriding*? Illustrate the use of *method overloading* and *method overriding* using suitable examples.
 - b. Explain exception handling in Java. Write a program to handle user defined exception "LowAttendance" which is thrown if attendance is less than 75.
 - c. Write a JAVA program to demonstrate how Threads are created, scheduled for execution and terminated.
 - d. Write a program to access the contents of database named *BTechJava* using JDBC.

Analog Electronics Circuits-II

Time Allowed : 2:30 Hours

Max. Marks : 50
Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section - A: [Short Answer Type Questions]

(10 x 1 = 10 Marks)

1.
 - a. What is BJT differential pair
 - b. What is common mode rejection?
 - c. What is DC offset
 - d. What is Ideal Op Amp
 - e. Draw OP amp as an integrator.
 - f. What is oscillation criterion?
 - g. What are Astable Multivibrators?
 - h. What is 555 IC timer?
 - i. What are Class AB amplifiers?
 - j. What are crystal oscillators?

Section-B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.
 - a. Calculate the CMRR (in dB) for the circuit measurements of $V_d = 1 \text{ mV}$, $V_o = 120 \text{ mV}$, $V_C = 1 \text{ mV}$, and $V_o = 20 \text{ mV}$.
 - b. Explain the working of series fed class A amplifier with the help of suitable diagrams.
 - c. Explain judging the stability of a feedback amplifier as a function of frequency using Nyquist criterion.
 - d. The output voltage of a voltage amplifier has been found to decrease by 20% when a load resistance of $1 \text{ k}\Omega$ is connected. What is the value of the amplifier output resistance?

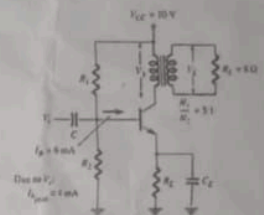
Section-C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.

a.

Calculate the ac power delivered to the $8\text{-}\Omega$ speaker for the circuit of shown Fig. The circuit component values result in a dc base current of 6 mA , and the input signal (V_i) results in a peak base current swing of 4 mA .



- b. Explain the working of FET phase shift oscillators. It is desired to design a phase-shift oscillator using an FET having $g_m = 5000 \text{ mS}$, $r_d = 40 \text{ k}\Omega$, and a feedback circuit value of $R = 10 \text{ k}\Omega$. Select the value of C for oscillator operation at 1 kHz and R_D for $A > 29$ to ensure oscillator action.
- c. Consider an inverting amplifier with a nominal gain of 1000 constructed from an op amp with an input offset voltage of 3 mV and with output saturation levels of $\pm 10 \text{ V}$.
 - (I) What is (approximately) the peak sine-wave input signal that can be applied without output clipping?
 - (II) If the effect of VOS is nulled at room temperature (25°C), how large an input can one now apply if: (1) the circuit is to operate at a constant temperature? (2) the circuit is to operate at a temperature in the range of 0°C to 75°C and the temperature coefficient of VOS is $10 \mu\text{V}/^\circ\text{C}$?
- d. Explain the working of wein bridge oscillator in detail. The tuned collector oscillator circuit used in the local oscillator of a radio receiver makes use of an LC tuned circuit with $L_1 = 58.6 \mu\text{H}$ and $C_1 = 300 \text{ pF}$. Calculate the frequency of oscillations.

B.E/B.Tech 4th SEMESTER (Electronics & Communication Engineering)
Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)
Digital System Design - II

Time Allowed : 2½ Hours

Max. Marks : 50

Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section – A: [Short Answer Type Questions]

(10 x 1 = 10 Marks)

1.

- a. What are various types of ring counters?
- b. What do you mean by race around condition in flip flops?
- c. Draw state transition diagram of a 3-bit up counter.
- d. What is importance of a tristate buffer in designing complex systems?
- e. The ADC with highest resolution is _____
- f. Arrange various ADC in decreasing order of their sampling rate.
- g. List three differences between CPLD and FPGA.
- h. What is the difference between STD_LOGIC and STD_LOGIC_VECTOR?
- i. What do you mean by STD_ULOGIC?
- j. What is the difference between DRAM and SDRAM?

Section–B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.

- a. With the help of Timing diagram demonstrate Read operation and write operation in SRAM.
- b. Discuss the construction and working of an 8-bit Bi-directional register.
- c. With the help of examples differentiate between Constant, Signal and Variable in VHDL.
- d. With the help of VHDL Code design a regular binary 0-to-9 counter.

Section–C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.

- a. Explain the construction and working of Dual Slope ADC.
- b. With the help of state machine approach design a MOD-10 counter.
- c. Using PROCESS statement design an 8-bit register in VHDL having CLK, RESET, ENABLE in addition to its I/O wires.
- d. With the help of VHDL Code design a 4-bit Ripple carry Full adder.

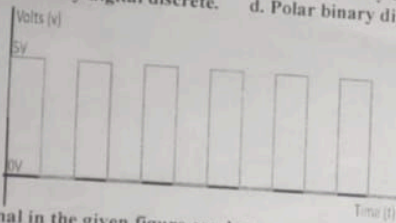
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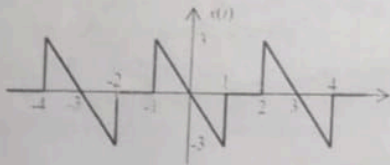
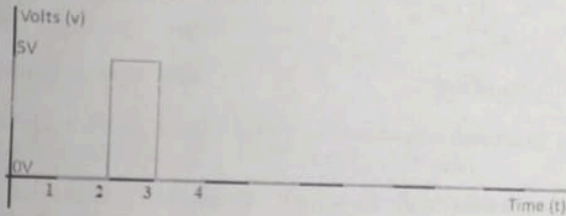
Note: Attempt all questions.

Unit I

1. The signal variation shown in the figure is: (1)
a. Unipolar binary digital Continuous. b. Polar Binary digital continuous.
c. Unipolar binary digital discrete. d. Polar binary digital discrete.



2. The signal in the given figure can be represented by. (1)
a. $5(u(t-2) - u(t-3))$
b. $5(u(2+t) - u(3+t))$
c. $5(\text{rect}(t-5/2))$
d. All of the above



3. Draw the waveform of the signal $g(t)=2+2x(t/2+2)$, if $x(t)$ is the above given waveform. (2)
4. An LTI system has impulse response $h(t) = u(t-1)$, If the input is $x(t) = u(t-2)$ the output $y(t)$ is? (2)
5. Draw the block diagram of a feedback control system. (2)
6. What system is being depicted by the below expression? (1)
 $Y[n] = \frac{1}{m} \sum_{k=0}^{m-1} x[n-k]$
9. The multipath communication system is modeled using which of the following systems. (1)
a. moving average system b. weighted moving average system
c. moving summer system d. a non linear system

UNIT-II

- Q1. For the signal $x(t)=3 u(t) \sin(100 \pi t)$ (5)
(a) Draw $x(2t)$.
(b) Draw $1+u(t)+x(t)$.
(c) calculate the power/energy.
- Q2. Draw the block diagram of a multipath communication system with three paths. (5)
- Q3. Discuss BIBO stability, linearity and time invariance for a system. (5)

UNIT-III

- Q5. Given a series RC circuit where the output voltage is taken across a capacitor,
(a) Determine the differential equation.
(b) Convert the differential equation into a block diagram.
(c) Using the differential equation, calculate the step response of the circuit.
(d) Using step response, find the impulse response of the circuit. (10)

B.E./B. Tech 4th SEMESTER (Electronics & Communication Engineering)
 Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)

Engineering Mathematics-IV

Max. Marks: 50

Time Allowed: 2½ Hours

Min. Marks: 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section – A: [Short Answer Type Questions]

(10 x 1= 10 Marks)

1.

- Using the Cauchy-Reiman equations, show that the function $f(z) = \bar{z}$ is not analytic at any point.
- Evaluate the integral $\int_c z^2 dz$, where c is the arc of the circle $|z| = 2$ from $\theta = 0$ to $\theta = \frac{\pi}{3}$.
- State Cauchy's theorem.
- Write Cauchy's inequality formula.
- Obtain the Taylor's series expansion of $f(z) = e^z$ about the point $z = 2$.
- Find the poles of the function $f(z) = \frac{(z+1)(z-1)}{(z-3)(z+2)}$.
- Compute the residues at all the isolated singular points of the function $f(z) = \frac{1}{z(z-1)}$.
- Find the singular points of the equation $x^2 y'' + (x + x^2)y' - y = 0$.
- Express the polynomial $3x^2 + 5x - 6$ in terms of Legendre polynomials.
- Write Bessel's differential equation.

Section-B: [Medium Answer Type Questions]

(4 x 5= 20 Marks)

2.

- Show that the function $f(z) = \sin z$ is analytic.
- Use the residue theorem to evaluate the contour integral $I = \int_c \frac{e^z - 1}{(z-1)(z-i)} dz$, $C: |z| = 2$
- Find the Laurent series expansion of the function $f(z) = e^{\frac{1}{z}}$ in the region $|z| > 0$.
- Express the sum $[6p_3(x) - 2p_1(x) + p_0(x)]$ of Legendre polynomials in terms of powers of x .

Section-C: [Long Answer Type Questions]

(2 x 10= 20 Marks)

3.

- Find the power series solution about $x = 0$ of the differential equation $y'' - 4y = 0$.
- State and prove Cauchy's integral formula.
- If ψ and ϕ are wavelets and f, g are functions which belong to $L^2(R)$, then show that $w_\psi (\alpha f + \beta g)(a, b) = \alpha w_\psi f(a, b) + \beta w_\psi g(a, b)$ where α and β are any two scalars.
- Classify the singular points of the function $\frac{(1-e^z) \cos(\frac{1}{z-2})}{z^2(z-8)(z^2-16)}$ in the finite complex plane.

B. Tech 4th Semester (ECE) (Batch: 2021)
 Engineering Mathematics-IV
 Course code: BSC-MTH41
 Mid-Semester Examination

Maximum Marks: 35
 Time: 1 : 50 Hours

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION 'A' AND 'B', AND ONLY ONE QUESTION FROM SECTION 'C'.

Section A

(1 × 10 = 10)

1. Define the term analytic function.
2. Find the modulus and amplitude of the complex number $-2 + 2i$.
3. Check the $\lim_{z \rightarrow 0} \frac{z}{|z|}$, exists or not
4. Check for Cauchy Reimann equations of the function $f(z) = z^2 + 2$.
5. Write the general Laurent expansion with center z_0 .
6. Check $u(x, y) = e^x \sin y$ is harmonic or not.
7. Find the value of integral $\int_{|z|=\frac{1}{2}} \frac{z^2+1}{(z-1)(z-2)} dz$
8. Find the order of zero at $z = 0$ for $f(z) = z^2(z-1)$
9. Write the poles of $f(z) = \frac{z-1}{z^2-1}$
10. Find the residue of $f(z) = \frac{z^2-2z+1}{(z-1)(z+1)}$ at $z = 1$.

$z = 0$
 $z^2 + x + iy$
 $(x+iy)^3 + x + iy$
 $x^3 + y^3 + 3xy^2 + 3x^2y + x + iy$

Section B

$z^2 = 0, z = 1$
 $(3 \times 5 = 15)$

Answer the following questions.

1. Show whether the function $f(z) = z^3 + x + iy$ is analytic or not
2. Solve the integral $\int_{|z|=3} \frac{z^2+1}{(z-1)(z-2)} dz$
3. Find the Taylor series expansion of $f(z) = \frac{z}{z+2}$

$\frac{z}{z+2} = 1 - \frac{2}{z+2}$

Section C

(1 × 10 = 10)

Answer the following questions.

1. Find the all residues of the function $f(z) = \frac{z^2+z+1}{z^2(z^2-3z+2)}$
2. Find the Laurent series expansion of $f(z) = \frac{1}{z^2-3z+2}$ in $|z| > 2$

$z^2 - 1 = 0$
 $z^2 = 1$
 $z = \pm 1$

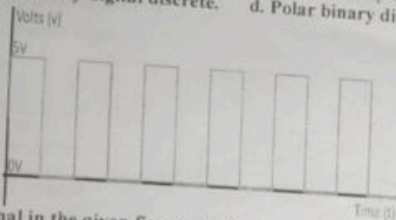
$(z-1)(z-2)$
 $z = -1, 1$



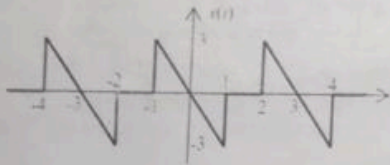
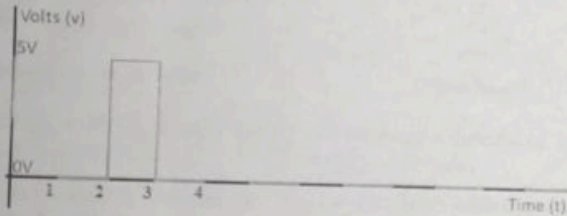
Note: Attempt all questions.

Unit I

1. The signal variation shown in the figure is: (1)
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4. An LTI system has impulse response $h(t) = u(t-1)$, If the input is $x(t) = u(t-2)$ the output $y(t)$ is? (2)
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6. What system is being depicted by the below expression? (1)
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UNIT-II

- Q1. For the signal $x(t)=3 u(t) \sin(100 \pi t)$ (5)
(a) Draw $x(2t)$.
(b) Draw $1+u(t)+x(t)$.
(c) calculate the power/energy.
- Q2. Draw the block diagram of a multipath communication system with three paths. (5)
- Q3. Discuss BIBO stability, linearity and time invariance for a system. (5)

UNIT-III

- Q5. Given a series RC circuit where the output voltage is taken across a capacitor,
(a) Determine the differential equation.
(b) Convert the differential equation into a block diagram.
(c) Using the differential equation, calculate the step response of the circuit.
(d) Using step response, find the impulse response of the circuit. (10)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INSTITUTE OF TECHNOLOGY
University of Kashmir, Zakura Campus - Hazratbal, Srinagar-190006

Semester: 4th

Course: Digital System Design II

Max. Marks: 35

(Attempt all the questions given below)

Batch: 2021

Course code: PCCECE43

Time Allowed: 1.5 Hours

SECTION A (Very Short Type)

((01*8) + (02*1) = 10 Marks)

1. How does a ring counter start?
2. Define Metastability?
3. What do you mean by resolution of a DAC?
4. How many address bits are needed to select all memory locations in the $16K \times 1$ RAM?
5. What is meant by set up and hold time of a flip flop?
6. What is tristate logic?
7. A memory system has a total of 8 memory chips each with 12 address lines and 4 data lines. What is the total capacity of the memory system in bytes?
8. What is the difference between Constant, Signal and Variable in VHDL?
9. The waveforms shown in figure 1 are applied to the inputs of a Nand SR latch. Assuming $Q=0$ initially, determine the waveform for Q. (2 marks)

SECTION B (Short Type)

(03*5=15 Marks)

Q1. What is modulus of a counter? Determine the mod and type (up or down) of the ripple counter shown in figure 2.

- Q2. (a) An 8 bit DAC has full scale output of 5 mA and full scale error of $\pm 0.25\%$ of full scale. Determine the range of expected output for input 10000010.
(b) Determine the conversion time of a 12 bit counter type ADC for an input clock frequency of 1 MHz.

Q3. Using proper diagrams discuss any one type of analog to digital converter.

SECTION C (Long Type)

(01*10=10 Marks)

Q1. For the state diagram shown in figure 3 design the clocked sequential circuit using T flip flop. Show all necessary tables and figures. Also take into consideration the state assignment and state reduction if applicable.



DEPARTMENT OF ELECTRONICS AND COMMUNICATION
INSTITUTE OF TECHNOLOGY

University of Kashmir, Zakura Campus Hazratbal, Srinagar-190006

Semester: 4th
Course: OOPS with Java
Time Allowed: 1 $\frac{1}{2}$ Hours

Batch: 2021
Max. Marks: 35

(Attempt all the questions given below)

SECTION A

(2*5=10 Marks)

1. What is difference between final, finally and finalize?
2. Discuss the use of this and super keyword with example?
3. Differentiate between String, String Buffer and String Builder classes in java?
4. Predict the output of following Java program?

```
class Test
{
    String str = "a";
    void A ()
    {
        try
        {
            str += "b";
            B ();
        }
        catch (Exception e)
        {
            str += "c";
        }
    }
    void B () throws Exception
    {
        try
        {
            str += "d";
            C ();
        }
        catch(Exception e)
        {
            throw new Exception ();
        }
        finally
        {
            str += "e";
        }
    }
    str += "f";
    void C () throws Exception
    {
        throw new Exception ();
    }
}
```

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B.Tech (Electronics and Communication Engineering)

Semester: 4th
Course Title: EMFW
Max. Marks: 35

Time: 1Hr 30mins
Course Code: PCCECE45
Min. Pass Marks: 14

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Section I

Q1.

Briefly Explain

- a) Electric Field Intensity
- b) Equipotential surface
- c) Electric Displacement

- d) Lorentz Force
- e) Plane wave
- f) Magnetostatics

Under what conditions will the Electric Field Intensity be:

- g) Conservative

- h) Irrotational

Write the mathematical expression for the following:

- i) Continuity equation

- j) Amperes Law

Section II (3x5 = 15 Marks)

Q2. Derive the expression for curl of Magnetic Field.

Q3. What is Electric Scalar potential? Prove $E = -\nabla V$.

Q4. Prove that the tangential component of both Electric and magnetic field is continuous across the boundary separating two dielectric media.

Section III (1x10 = 10 Marks)

Q5. Derive wave equation for lossless/non-conducting medium. Write the derived equations for time harmonic form and in conducting medium.

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION 'A' AND 'B', AND ONLY ONE QUESTION FROM SECTION 'C'.

Section A

(1 × 10 = 10)

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1. Define the term analytic function.
2. Find the modulus and amplitude of the complex number $-2 + 2i$.
3. Check the $\lim_{z \rightarrow 0} \frac{z}{|z|}$, exists or not
4. Check for Cauchy Reimann equations of the function $f(z) = z^2 + 2$.
5. Write the general Laurent expansion with center z_0 .
6. Check $u(x, y) = e^x \sin y$ is harmonic or not.
7. Find the value of integral $\int_{|z|=1} \frac{z^2+1}{(z-1)(z-2)} dz$
8. Find the order of zero at $z=0$ for $f(z) = z^2(z-1)$
9. Write the poles of $f(z) = \frac{z-1}{z^2-1}$
10. Find the residue of $f(z) = \frac{z^2-2z+1}{(z-1)(z+1)}$ at $z=1$.

$z=0$
 $z^2 + x + iy$
 $z^2 = (x+iy)^2 = x^2 - y^2 + 2ixy$
 $x^3 + y^3 + 3xy^2 + 3x^2y$
 $z^2 = 0, \therefore 1$
 $(3 \times 5 = 15)$

Section B

Answer the following questions.

1. Show whether the function $f(z) = z^3 + x + iy$ is analytic or not
2. Solve the integral $\int_{|z|=2} \frac{z^2+1}{(z-1)(z-2)} dz$
3. Find the Taylor series expansion of $f(z) = \frac{z}{z+2}$

$\frac{z}{z+2} = 1 - \frac{2}{z+2}$

Section C

(1 × 10 = 10)

Answer the following questions.

1. Find the all residues of the function $f(z) = \frac{z^2+z+1}{z^2(z^2-3z+2)}$
2. Find the Laurent series expansion of $f(z) = \frac{1}{z^2-3z+2}$ in $|z| > 2$

$z^2 - 1 = 0$
 $z^2 = 1$
 $z = -1, 1$
 $(z-1)(z+1)$
 $z = -1, 1$



BRAIN TEASER ACADEMY

B.E./B. Tech 4th SEMESTER (Electronics & Communication Engineering)
 Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)

Engineering Mathematics-IV

Max. Marks: 50

Time Allowed: 2½ Hours

Min. Marks: 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section – A: [Short Answer Type Questions]

(10 x 1= 10 Marks)

1.

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- Find the singular points of the equation $x^2 y'' + (x + x^2)y' - y = 0$.
- Express the polynomial $3x^2 + 5x - 6$ in terms of Legendre polynomials.
- Write Bessel's differential equation.

Section-B: [Medium Answer Type Questions]

(4 x 5= 20 Marks)

2.

- Show that the function $f(z) = \sin z$ is analytic.
- Use the residue theorem to evaluate the contour integral $I = \int_c \frac{e^z - 1}{(z-1)(z-i)} dz$, $C: |z| = 2$
- Find the Laurent series expansion of the function $f(z) = e^{\frac{1}{z}}$ in the region $|z| > 0$.
- Express the sum $[6p_3(x) - 2p_1(x) + p_0(x)]$ of Legendre polynomials in terms of powers of x .

Section-C: [Long Answer Type Questions]

(2 x 10= 20 Marks)

3.

- Find the power series solution about $x = 0$ of the differential equation $y'' - 4y = 0$.
- State and prove Cauchy's integral formula.
- If ψ and ϕ are wavelets and f, g are functions which belong to $L^2(R)$, then show that $w_\psi(\alpha f + \beta g)(a, b) = \alpha(w_\psi f)(a, b) + \beta(w_\psi g)(a, b)$ where α and β are any two scalars.
- Classify the singular points of the function $\frac{(1-e^z) \cos(\frac{1}{z-2})}{z^2(z-8)(z^2-16)}$ in the finite complex plane.

Time Allowed : 2 1/2 Hours

Max. Marks : 50
 Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"
 Section - A: [Short Answer Type Questions] (10 x 1 = 10 Marks)

1.
 - a. What is the net area under $\delta(t/2)$? ($\delta(t)$ is unit-impulse)
 - b. The signal $r(4t)$ is fed to a differentiator. What is output? ($r(t)$ is unit-ramp)
 - c. $x[n] = \mu[n] + \mu[-n]$, where $\mu[n]$ is the discrete-time unit-step. What is $x[-1] + x[0] + x[1]$?
 - d. What is the significance of ROC of the Laplace Transform of a signal?
 - e. Write the Laplace Transform of the impulse response of a system governed by: $(10D^2 + 100D)y = 1000r(t)$
 - f. Write down the statement of Parseval's theorem for aperiodic signals.
 - g. Given $\mu(t)$, the unit-step function, the LTI system with $h(t) = \mu(t) - \mu(-t)$ is? (stable/unstable).
 - h. Write down the rms value of $f(t) = \frac{5}{\sqrt{2}} + 6\cos(2\pi t) + 8\sin(20\pi t)$
 - i. Given $\delta(t)$, how many integrators are needed to generate $x(t) = t^4 \mu(t)$?
 - j. Define BIBO stability.

Section-B: [Medium Answer Type Questions] (4 x 5 = 20 Marks)

2.
 - a. What is the average value of $\cos(0) + \cos(t) + \cos(2t) + \cos(3t) + \dots + \cos(10t)$? What is the average value of $\sin(t)$ over the range $[0, \pi]$?
 - b. $x(t) \leftrightarrow X(j\omega)$, derive the F-transform of conjugate($x(t)$) and $x(t-10)$
 - c. Describe the "Gibbs" phenomena encountered in the spectrum of discontinuous signals.
 - d. Given a differentiator, find one bounded input which gives unbounded output and one unbounded input which gives bounded output.

Section-C: [Long Answer Type Questions] (2 x 10 = 20 Marks)

3.
 - a. Prove that multiplication of signals corresponds to convolution in the frequency domain.

4. State and prove the initial and final-value theorems for unilateral Laplace transforms.

c. Given $X(s) = \frac{6}{(s+3)(s+2)}$, sketch the pole-zero plot and hence derive the expressions for all possible inverse-L. transforms along with their respective ROCs.

d. Derive the Fourier-Transform of the signum function.

Handwritten notes and calculations:

2. (a) Avg value = $\frac{1}{T} \int_0^T \cos(x) dx = \frac{1}{2\pi} \int_0^{2\pi} \cos(x) dx = 0$

Also Avg. value = $\frac{1}{\pi} \int_0^{\pi} \sin t dt = \frac{1}{\pi} [-\cos t]_0^{\pi} = \frac{1}{\pi} (-(-1) - (-1)) = \frac{1}{\pi} (1 - 1) = 0$

Also Avg. value = $\frac{1}{\pi} \int_0^{\pi} \cos t dt = \frac{1}{\pi} [\sin t]_0^{\pi} = \frac{1}{\pi} (0 - 0) = 0$

Also Avg. value = $\frac{1}{\pi} \int_0^{\pi} \sin^2 t dt = \frac{1}{\pi} \int_0^{\pi} \frac{1 - \cos 2t}{2} dt = \frac{1}{2\pi} [t - \frac{\sin 2t}{2}]_0^{\pi} = \frac{1}{2\pi} (\pi - 0) = \frac{1}{2}$

Also Avg. value = $\frac{1}{\pi} \int_0^{\pi} \cos^2 t dt = \frac{1}{\pi} \int_0^{\pi} \frac{1 + \cos 2t}{2} dt = \frac{1}{2\pi} [t + \frac{\sin 2t}{2}]_0^{\pi} = \frac{1}{2\pi} (\pi + 0) = \frac{1}{2}$

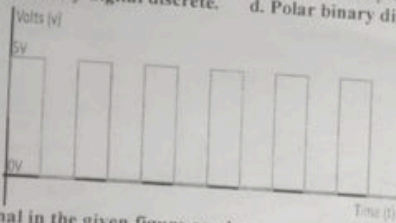
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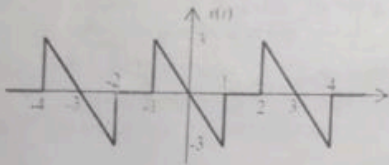
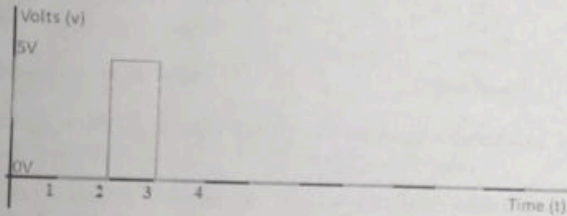
Note: Attempt all questions.

Unit I

1. The signal variation shown in the figure is: (1)
a. Unipolar binary digital Continuous. b. Polar Binary digital continuous.
c. Unipolar binary digital discrete. d. Polar binary digital discrete.



2. The signal in the given figure can be represented by. (1)
a. $5(u(t-2) - u(t-3))$
b. $5(u(2+t) - u(3+t))$
c. $5(\text{rect}(t-5/2))$
d. All of the above



3. Draw the waveform of the signal $g(t)=2+2x(t/2+2)$, if $x(t)$ is the above given waveform. (2)
4. An LTI system has impulse response $h(t) = u(t-1)$, If the input is $x(t) = u(t-2)$ the output $y(t)$ is? (2)
5. Draw the block diagram of a feedback control system. (2)
6. What system is being depicted by the below expression? (1)
 $Y[n] = \frac{1}{m} \sum_{k=0}^{m-1} x[n-k]$
9. The multipath communication system is modeled using which of the following systems. (1)
a. moving average system b. weighted moving average system
c. moving summer system d. a non linear system

UNIT-II

- Q1. For the signal $x(t)=3 u(t) \sin(100 \pi t)$ (5)
(a) Draw $x(2t)$.
(b) Draw $1+u(t)+x(t)$.
(c) calculate the power/energy.
- Q2. Draw the block diagram of a multipath communication system with three paths. (5)
- Q3. Discuss BIBO stability, linearity and time invariance for a system. (5)

UNIT-III

- Q5. Given a series RC circuit where the output voltage is taken across a capacitor,
(a) Determine the differential equation.
(b) Convert the differential equation into a block diagram.
(c) Using the differential equation, calculate the step response of the circuit.
(d) Using step response, find the impulse response of the circuit. (10)

B.E/B.Tech 4th SEMESTER (Electronics & Communication Engineering)
Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)
Digital System Design - II

Time Allowed : 2½ Hours

Max. Marks : 50

Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section – A: [Short Answer Type Questions]

(10 x 1 = 10 Marks)

1.

- a. What are various types of ring counters?
- b. What do you mean by race around condition in flip flops?
- c. Draw state transition diagram of a 3-bit up counter.
- d. What is importance of a tristate buffer in designing complex systems?
- e. The ADC with highest resolution is _____
- f. Arrange various ADC in decreasing order of their sampling rate.
- g. List three differences between CPLD and FPGA.
- h. What is the difference between STD_LOGIC and STD_LOGIC_VECTOR?
- i. What do you mean by STD_ULOGIC?
- j. What is the difference between DRAM and SDRAM?

Section–B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.

- a. With the help of Timing diagram demonstrate Read operation and write operation in SRAM.
- b. Discuss the construction and working of an 8-bit Bi-directional register.
- c. With the help of examples differentiate between Constant, Signal and Variable in VHDL.
- d. With the help of VHDL Code design a regular binary 0-to-9 counter.

Section–C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.

- a. Explain the construction and working of Dual Slope ADC.
- b. With the help of state machine approach design a MOD-10 counter.
- c. Using PROCESS statement design an 8-bit register in VHDL having CLK, RESET, ENABLE in addition to its I/O wires.
- d. With the help of VHDL Code design a 4-bit Ripple carry Full adder.

#####

Analog Electronics Circuits-II

Time Allowed : 2:30 Hours

Max. Marks : 50

Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"**Section - A: [Short Answer Type Questions]**

(10 x 1 = 10 Marks)

1.
 - a. What is BJT differential pair
 - b. What is common mode rejection?
 - c. What is DC offset
 - d. What is Ideal Op Amp
 - e. Draw OP amp as an integrator.
 - f. What is oscillation criterion?
 - g. What are Astable Multivibrators?
 - h. What is 555 IC timer?
 - i. What are Class AB amplifiers?
 - j. What are crystal oscillators?

Section-B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.
 - a. Calculate the CMRR (in dB) for the circuit measurements of $V_d = 1 \text{ mV}$, $V_o = 120 \text{ mV}$, $V_C = 1 \text{ mV}$, and $V_o = 20 \text{ mV}$.
 - b. Explain the working of series fed class A amplifier with the help of suitable diagrams.
 - c. Explain judging the stability of a feedback amplifier as a function of frequency using Nyquist criterion.
 - d. The output voltage of a voltage amplifier has been found to decrease by 20% when a load resistance of $1 \text{ k}\Omega$ is connected. What is the value of the amplifier output resistance?

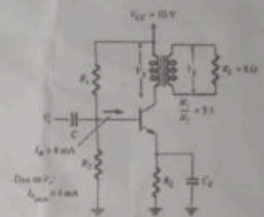
Section-C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.

a.

Calculate the ac power delivered to the $8\text{-}\Omega$ speaker for the circuit of shown Fig. The circuit component values result in a dc base current of 6 mA , and the input signal (V_i) results in a peak base current swing of 4 mA .



- b. Explain the working of FET phase shift oscillators. It is desired to design a phase-shift oscillator using an FET having $g_m = 5000 \text{ mS}$, $r_d = 40 \text{ k}\Omega$, and a feedback circuit value of $R = 10 \text{ k}\Omega$. Select the value of C for oscillator operation at 1 kHz and R_D for $A > 29$ to ensure oscillator action.
- c. Consider an inverting amplifier with a nominal gain of 1000 constructed from an op amp with an input offset voltage of 3 mV and with output saturation levels of $\pm 10 \text{ V}$.
 - (I) What is (approximately) the peak sine-wave input signal that can be applied without output clipping?
 - (II) If the effect of VOS is nulled at room temperature (25°C), how large an input can one now apply if: (1) the circuit is to operate at a constant temperature? (2) the circuit is to operate at a temperature in the range of 0°C to 75°C and the temperature coefficient of VOS is $10 \mu\text{V}/^\circ\text{C}$?
- d. Explain the working of wein bridge oscillator in detail. The tuned collector oscillator circuit used in the local oscillator of a radio receiver makes use of an LC tuned circuit with $L_1 = 58.6 \mu\text{H}$ and $C_1 = 300 \text{ pF}$. Calculate the frequency of oscillations.

B.E/B.Tech 4th SEMESTER (Electronics & Communication Engineering)
Session: October- 2023 Regular (Batch 2021) & Backlog (Batch 2020)

OOPS in Java

Time Allowed : 2½ Hours

Max. Marks : 50
Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section - A: [Short Answer Type Questions]

(10 x 1 = 10 Marks)

1.
 - a. What is the difference between machine-code and byte-code?
 - b. What is typecasting?
 - c. Does Java have a default copy constructor?
 - d. List two uses of *super* keyword in JAVA?
 - e. Can we have a *try* block without a *catch* block in Java?
 - f. List two ways of declaring a string in Java?
 - g. List the different states a thread can go through in its lifetime?
 - h. Does importing a package in Java import sub-packages as well?
 - i. Does Java Applet require the existence of the Java Virtual Machine (JVM)?
 - j. What are the various components of the JDBC?

Section-B: [Medium Answer Type Questions]

(4 x 5 = 20 Marks)

2.
 - a. Explain in detail how Java is a portable language across machines and platforms?
 - b. What is Inner Class? Write a program to implement inner class?
 - c. Using a java program illustrate the concept and use of *Runnable* interface.
 - d. Write a program to copy the contents of one file to another using stream class.

Section-C: [Long Answer Type Questions]

(2 x 10 = 20 Marks)

3.
 - a. What is the difference between *method overloading* and *method overriding*? Illustrate the use of *method overloading* and *method overriding* using suitable examples.
 - b. Explain exception handling in Java. Write a program to handle user defined exception "LowAttendance" which is thrown if attendance is less than 75.
 - c. Write a JAVA program to demonstrate how Threads are created, scheduled for execution and terminated.
 - d. Write a program to access the contents of database named *BTechJava* using JDBC.

Electronic Fields and Waves

Time Allowed: 2½ Hours

Max. Marks : 50

Min. Marks : 20

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION "A" & "B" AND ANY TWO QUESTIONS FROM SECTION "C"

Section - A: (Short Answer Type Questions)

(10 x 1 = 10 Marks)

1.
 - a. State Coulomb's Law and describe its significance in electrostatics.
 - b. What is the Poynting Theorem, and what does it describe in electromagnetic theory?
 - c. What is Faraday Rotation?
 - d. Two point charges, $+5 \mu\text{C}$ and $-3 \mu\text{C}$, are separated by a distance of 2 meters. Calculate the electric force between them using Coulomb's law.
 - e. Describe the Poynting vector and its role in Poynting's theorem. What does the Poynting vector represent physically?
 - f. Write all the four Maxwell's equations in differential and integral form.
 - g. Define the terms "phase velocity" and "group velocity".
 - h. What does the term "magnetic flux" represent in the context of magnetic fields and surfaces?
 - i. Which of Maxwell's Equations describes how magnetic fields are generated by electric currents and changing electric fields?
 - j. Describe the concept of group velocity, and explain its importance in wavepacket propagation.

Section-B: (Medium Answer Type Questions)

(4 x 5 = 20 Marks)

2.
 - a.
 - i. Twelve equal charges, q , are situated at the corners of a regular 12-sided polygon (for instance, one on each numeral of a clock face). What is the net force on a test charge Q at the center?
 - ii. Suppose one of the 12 q 's is removed (the one at "6 o'clock"). What is the force on Q ? Explain.
 - b. Describe the relationship between the electric field, magnetic field, and the direction of wave propagation in an electromagnetic wave. How do these fields interact?

c. Explain the concept of a plane wave and its mathematical representation. How does a plane wave differ in a lossless medium compared to a lossy medium?

d. Calculate the reflection and transmission coefficients for a plane wave incident on the interface between a lossless medium and a lossy medium. Explain the physical significance of these coefficients.

Section-C: (Long Answer Type Questions)

(2 x 10 = 20 Marks)

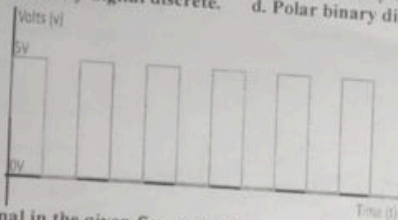
3.
 - a. A plane electromagnetic wave has an electric field amplitude of 100 V/m and a magnetic field amplitude of 0.4 T. Calculate the intensity of the wave, and determine the power carried by the wave through a given area. Apply the Poynting theorem in your calculations.
 - b. Derive the Wave Equation for a Plane Wave in a Lossless Medium
 - c. For an electromagnetic wave with oblique incidence at a conducting boundary, derive the expressions for the reflection coefficient (R) and the transmission coefficient (T).
 - d. Derive the Biot-Savart law and provide an example of its application to calculate the magnetic field at a point.



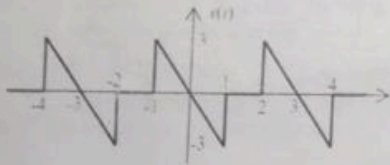
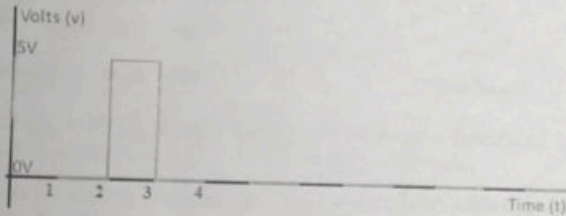
Note: Attempt all questions.

Unit I

1. The signal variation shown in the figure is: (1)
a. Unipolar binary digital Continuous. b. Polar Binary digital continuous.
c. Unipolar binary digital discrete. d. Polar binary digital discrete.



2. The signal in the given figure can be represented by. (1)
a. $5(u(t-2) - u(t-3))$
b. $5(u(2+t) - u(3+t))$
c. $5(\text{rect}(t-5/2))$
d. All of the above



3. Draw the waveform of the signal $g(t)=2+2x(t/2+2)$, if $x(t)$ is the above given waveform. (2)
4. An LTI system has impulse response $h(t) = u(t-1)$, If the input is $x(t) = u(t-2)$ the output $y(t)$ is? (2)
5. Draw the block diagram of a feedback control system. (2)
6. What system is being depicted by the below expression? (1)
 $Y[n] = \frac{1}{m} \sum_{k=0}^{m-1} x[n-k]$
9. The multipath communication system is modeled using which of the following systems. (1)
a. moving average system b. weighted moving average system
c. moving summer system d. a non linear system

UNIT-II

- Q1. For the signal $x(t)=3 u(t) \sin(100 \pi t)$ (5)
(a) Draw $x(2t)$.
(b) Draw $1+u(t)+x(t)$.
(c) calculate the power/energy.
- Q2. Draw the block diagram of a multipath communication system with three paths. (5)
- Q3. Discuss BIBO stability, linearity and time invariance for a system. (5)

UNIT-III

- Q5. Given a series RC circuit where the output voltage is taken across a capacitor,
(a) Determine the differential equation.
(b) Convert the differential equation into a block diagram.
(c) Using the differential equation, calculate the step response of the circuit.
(d) Using step response, find the impulse response of the circuit. (10)

B.Tech (Electronics and Communication Engineering)

Semester: 4th
Course Title: EMFW
Max. Marks: 35

Time: 1Hr 30mins
Course Code: PCCECE45
Min. Pass Marks: 14

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Section I

Q1.

Briefly Explain

- a) Electric Field Intensity
- b) Equipotential surface
- c) Electric Displacement

- d) Lorentz Force
- e) Plane wave
- f) Magnetostatics

Under what conditions will the Electric Field Intensity be:

- g) Conservative

- h) Irrotational

Write the mathematical expression for the following:

- i) Continuity equation

- j) Amperes Law

Section II (3x5 = 15 Marks)

Q2. Derive the expression for curl of Magnetic Field.

Q3. What is Electric Scalar potential? Prove $E = -\nabla V$.

Q4. Prove that the tangential component of both Electric and magnetic field is continuous across the boundary separating two dielectric media.

Section III (1x10 = 10 Marks)

Q5. Derive wave equation for lossless/non-conducting medium. Write the derived equations for time harmonic form and in conducting medium.



DEPARTMENT OF ELECTRONICS AND COMMUNICATION
INSTITUTE OF TECHNOLOGY

University of Kashmir, Zakura Campus Hazratbal, Srinagar-190006

Semester: 4th
Course: OOPS with Java
Time Allowed: 1 $\frac{1}{2}$ Hours

Batch: 2021
Max. Marks: 35

(Attempt all the questions given below)

SECTION A

(2*5=10 Marks)

1. What is difference between final, finally and finalize?
2. Discuss the use of this and super keyword with example?
3. Differentiate between String, String Buffer and String Builder classes in java?
4. Predict the output of following Java program?

```
class Test
{
    String str = "a";
    void A ()
    {
        try
        {
            str += "b";
            B ();
        }
        catch (Exception e)
        {
            str += "c";
        }
    }
    void B () throws Exception
    {
        try
        {
            str += "d";
            C ();
        }
        catch(Exception e)
        {
            throw new Exception ();
        }
        finally
        {
            str += "e";
        }
    }
    str += "f";
    void C () throws Exception
    {
        throw new Exception ();
    }
}
```

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INSTITUTE OF TECHNOLOGY
University of Kashmir, Zakura Campus - Hazratbal, Srinagar-190006

Semester: 4th

Course: Digital System Design II

Max. Marks: 35

(Attempt all the questions given below)

Batch: 2021

Course code: PCCECE43

Time Allowed: 1.5 Hours

SECTION A (Very Short Type)

((01*8) + (02*1) = 10 Marks)

1. How does a ring counter start?
2. Define Metastability?
3. What do you mean by resolution of a DAC?
4. How many address bits are needed to select all memory locations in the $16K \times 1$ RAM?
5. What is meant by set up and hold time of a flip flop?
6. What is tristate logic?
7. A memory system has a total of 8 memory chips each with 12 address lines and 4 data lines. What is the total capacity of the memory system in bytes?
8. What is the difference between Constant, Signal and Variable in VHDL?
9. The waveforms shown in figure 1 are applied to the inputs of a Nand SR latch. Assuming $Q=0$ initially, determine the waveform for Q. (2 marks)

SECTION B (Short Type)

(03*5=15 Marks)

Q1. What is modulus of a counter? Determine the mod and type (up or down) of the ripple counter shown in figure 2.

- Q2. (a) An 8 bit DAC has full scale output of 5 mA and full scale error of $\pm 0.25\%$ of full scale. Determine the range of expected output for input 10000010.
(b) Determine the conversion time of a 12 bit counter type ADC for an input clock frequency of 1 MHz.

Q3. Using proper diagrams discuss any one type of analog to digital converter.

SECTION C (Long Type)

(01*10=10 Marks)

Q1. For the state diagram shown in figure 3 design the clocked sequential circuit using T flip flop. Show all necessary tables and figures. Also take into consideration the state assignment and state reduction if applicable.

NOTE: ATTEMPT ALL QUESTIONS FROM SECTION 'A' AND 'B', AND ONLY ONE QUESTION FROM SECTION 'C'.

Section A

(1 × 10 = 10)

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1. Define the term analytic function.
2. Find the modulus and amplitude of the complex number $-2 + 2i$.
3. Check the $\lim_{z \rightarrow 0} \frac{z}{|z|}$, exists or not
4. Check for Cauchy Reimann equations of the function $f(z) = z^2 + 2$.
5. Write the general Laurent expansion with center z_0 .
6. Check $u(x, y) = e^x \sin y$ is harmonic or not.
7. Find the value of integral $\int_{|z|=1} \frac{z^2+1}{(z-1)(z-2)} dz$
8. Find the order of zero at $z=0$ for $f(z) = z^2(z-1)$
9. Write the poles of $f(z) = \frac{z^{-1}}{z^2-1}$
10. Find the residue of $f(z) = \frac{z^2-2z+1}{(z-1)(z+1)}$ at $z=1$.

$z = 0$
 $z^2 + 2x + iy$
 $z^2 = (x+iy)^2 = x^2 - y^2 + 2xyi$
 $z^3 = x^3 + 3xy^2 + 3x^2y + iy^3$
 $z^2 = 0, \text{ order } 2$
 $(3 \times 5 = 15)$

Section B

Answer the following questions.

1. Show whether the function $f(z) = z^3 + x + iy$ is analytic or not
2. Solve the integral $\int_{|z|=2} \frac{z^2+1}{(z-1)(z-2)} dz$
3. Find the Taylor series expansion of $f(z) = \frac{z}{z+2}$

$\frac{z}{z+2} = 1 - \frac{2}{z+2}$

Section C

(1 × 10 = 10)

Answer the following questions.

1. Find the all residues of the function $f(z) = \frac{z^2+z+1}{z^2(z^2-3z+2)}$
2. Find the Laurent series expansion of $f(z) = \frac{1}{z^2-3z+2}$ in $|z| > 2$

$z^2 - 1 = 0$
 $z^2 = 1$
 $z = -1, 1$
 $(z-1)(z+1)$
 $z = -1, 1$