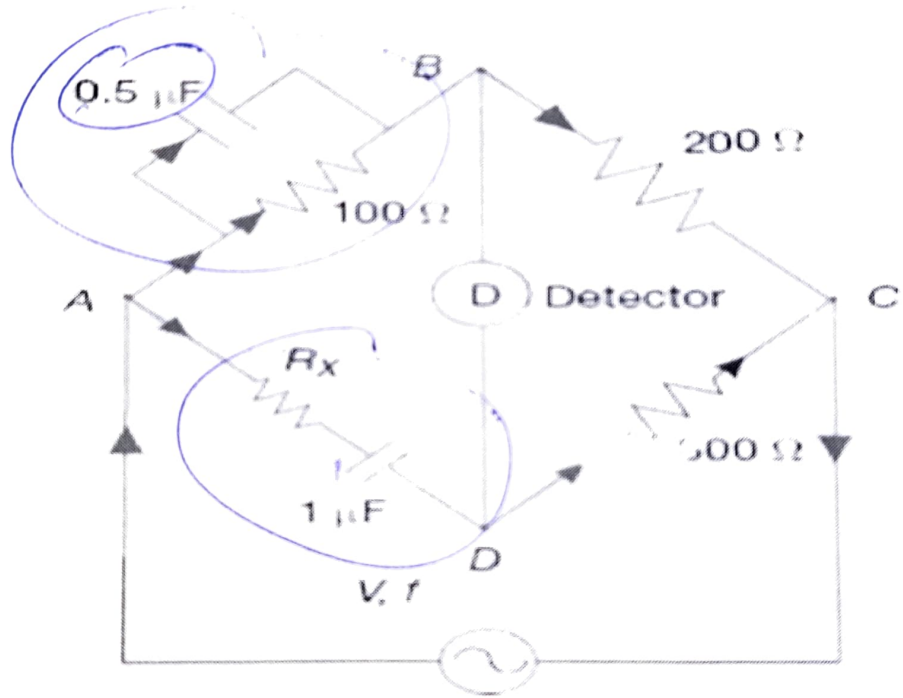
1) **The four arms of a bridge supplied from a sinuso..al source are configured as follows: Arm AB: A resistance of 100 Ω in parallel with a capacitance of 0.5 μF Arm BC: A 200 Ω noninductive resistance; Arm CD: A 800 Ω noninductive resistance; Arm DA: A resistance Rx in series with a 1 μF capacitance**

   a) **Determine the value of Rx and the frequency at which the bridge will balance.**

   b) **If the Rx value is doubled, then how much current is flowing through the detector.**



$100 + 0.5\times10^{-6}$

$100 \times 0.5\times10^{-6}$

$\frac{1}{j\omega C}$

$\frac{1}{j\omega C}$

$j\omega C$

$\frac{1}{R_x} + \frac{1}{j\omega 1\times10^{-6}}$

$\frac{j\omega\times10^{-6} + R_x}{R_x(j\omega\times10^{-6})}$

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

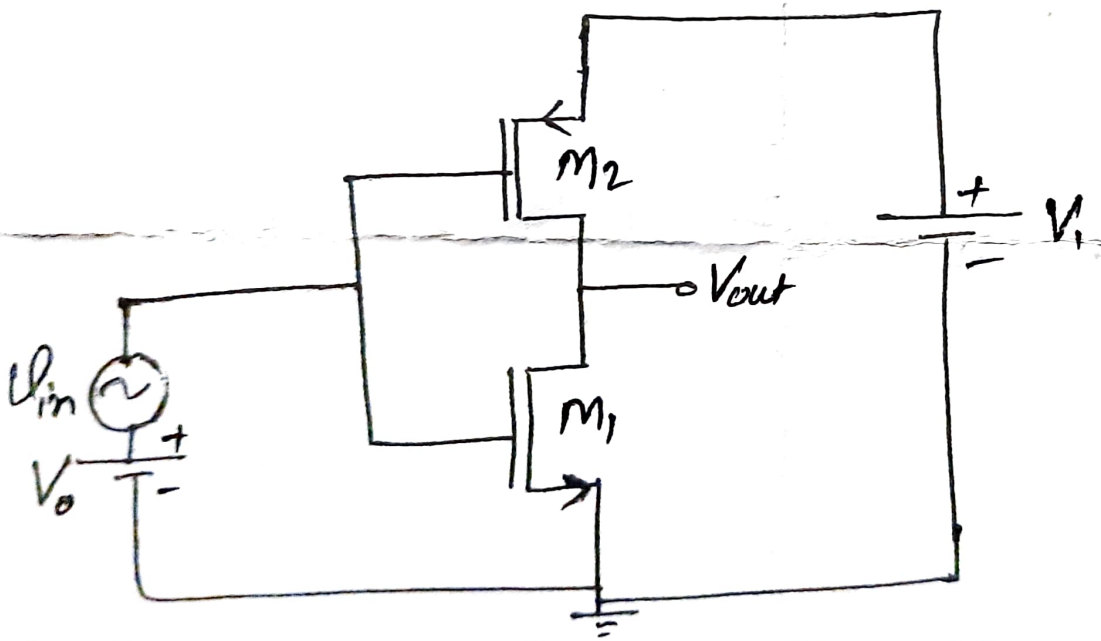
EC203/EC514 [Analog Electronics]

Spring 2022-23, Quiz-II

Time: 12:00 PM to 12:30 PM, Date: 12th April, 2023

Full marks: 10

1. Draw the neat and clean small signal circuit of given circuit with proper labeling. $(A>0)$



2. The low-frequency parameters of a common-emitter amplifier are given a collector current, $I_c = 10$ mA, and $V_{CE} = 10$ V. The parameters values are $h_{ie} = 1\ k\Omega$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$, and $h_{oe} = 25\ \mu A/V$.

   a) Draw the hybrid and pi model of a common-emitter amplifier.

   b) Find the voltage gain of a hybrid model common-emitter amplifier.

Management concepts and Technique

Final Term Examination (HS201)

(Total Marks-50, Time-3 Hrs)

Que.1 a. What are the important aspect in wage & salary administration Which are obvious concerns of personnel manager?-5 Marks

b.What do you mean by wage incentive? Explain the characteristic of a sound incentive plan-5 Marks

Que.2 a.Define and explain Lorenz curve diagram ?-3.5 Marks

b. Explain what is Gini co-efficient & How to calculate Gini index-3.5 Marks

c. Suggest Three Methods to reduce Gini coefficient of a country? -3 Marks

Que.3. a)Discuss demand analysis and it's importance?

b) What is change in demand ? explain it with the help of a demand curve ?explain law of demand why it is important

c)How the law of demand can be broken?

Que.4 a. Explain relationship between marginal cost & average cost. Illustrate the same graphically also.-5Marks.

b.Describe different models & features of oligiopoly-5 Marks

Que.5 a)What is globalization and how it affects Indian economy

b) What is consumer surplus ? How to calculate it

c) How does demand affect consumer surplus

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR
HS201 [MANAGEMENT CONCEPTS AND TECHNOLOGY],
Autumn 2022-23, Mid Semester Examination
Time: 10:00 AM to 12:00 NOON (120 minutes), Full marks: 30, Date: 30th September, 2022

Mid Term Examination(HS201)

(Total Marks-30, Time-120 Minutes)

(Total Three Questions Marks indicated in the questions)

1. A. What is meaning of staffing? Explain the importance of staffing.-3 Marks

   B. Define recruitment & its need.What are methods & source of recruitment-4 Marks.

   C. Explain process of slection. 3 Marks.

2. A. List out & explain Fayol's principle of management-3 Marks

   B.What is planning.What are essentials of a good plan. Explain different types of planning-3.5 Marks

   C.What is the importance & purpose of organizational Structure. Compare between formal & informal Organization-3.5 Marks.

3. A. Discuss Herzberg's theory of motivation-3 Marks

   B. How may this theory be useful to top management-3.5 Marks

   C. What are possible grounds on which managers may criticize this theory-3.5 Marks.

Herzberg

motivation theory

Engineering Mathematics III(B.Tech 2021-2025)

End Semester Examination

Full Marks – 50 Time: 3 hours

1(a) Discuss the existence of limit for the function $f(z) = \frac{\bar{z}}{z}$. [3 marks]

(b) Show that the function $f(z) = z^2$ is not uniformly continuous on $\mathbb{C}$ whereas it is uniformly continuous on $\Delta_R = \{z : |z| < R\}$, where R is a fixed positive number. [3 marks]

(c) Show that a real-valued function of a complex variable either has derivative zero or the derivative does not exist. [2 marks]

(d) Show that if u and v are harmonic conjugates of each other in some domain, then u and v must be constants there. [2 marks]

2(a) It is given that

$$z = \cos\theta + i\sin\theta,\ 0 \le z \le 2\pi$$

then show that

$$\frac{2}{1+z} = 1 - i\tan\left(\frac{\theta}{2}\right).\ [3marks]$$

(b) z_1 and z_2 are complex numbers with strictly positive real and imaginary parts. Then show that

$$|z_1 + z_2| \ge \frac{1}{\sqrt{2}}(|z_1| + |z_2|).\ [3marks]$$

(c) Consider

$$f(z) = \begin{cases} \frac{z^5}{|z|^4}, & z \neq 0 \\ 0, & z = 0. \end{cases}$$

Show that $f(z)$ satisfy C-R equations but not differentiable at the origin. [4 marks]

3(a) Derive the C-R equations and the Laplace equation in polar form. [5 marks]

(b) Find the radius of convergence of the power series $\sum_{n=1}^{\infty} \frac{z^n}{n2^n}$. [2 marks]

(c) Consider the function $u(x,y) = 4xy - x^3 + 3xy^2$. Show that $u(x,y)$ is harmonic in $\mathbb{R}^2$ and find the harmonic conjugate $v(x,y)$ in $\mathbb{C}$ for $u(x,y)$. [3 marks]

4(a) ω is a cube root of unity. Find the value of $\frac{1}{2^5}\left[(1-\omega+\omega^2)^{10} + (1+\omega-\omega^2)^{10}\right]$. [3 marks]

(b) The complex number z is given by $z = \frac{a+ib}{a-ib}$, $a, b \in \mathbb{R}$. Then show that $\frac{z^2+1}{2z} = \frac{a^2-b^2}{a^2+b^2}$. [3 marks]

(c) Consider

$$f(z) = u + iv = \begin{cases} \frac{x^3-y^3}{x^2+y^2} + i\frac{x^3+y^3}{x^2+y^2}, & if\ (x,y) \neq (0,0) \\ 0, & if\ (x,y) = (0,0). \end{cases}$$

Show that $f(z)$ satisfy C-R equations but not differentiable at the origin. [4 marks]

5(a) Find the radius of convergence and interval of convergence of the series $\sum_{n=1}^{\infty} \frac{n(x+2)^n}{5^{n-1}}$. [2+2 marks]

(b) Consider the function $f(x) = \ln x$. Approximate $f(x)$ by Taylor polynomial of degree 3 centered at $x = 2$. [3 marks]

(c) Show that the function $u(x,y) = \tan^{-1}\frac{y}{x}$ is harmonic for $x > 0$. [3 marks]

Indian Institute of Information Technology, Bhagalpur

Mid Semester Examination

Third Semester

B.Tech 2021–2025

MA201: Engineering Mathematics III

Full Marks – 30 Time: 2 hours

Answer all the questions.

1(a) Show that the field $\mathbb{C}$ can not be totally ordered in consistence with the usual order in $\mathbb{R}$. [2]

(b) Show that the function $f(z) = z^n$ is single-valued if and only if n is an integer. [2]

(c) Discuss the existence of limit for the function $f(z) = \frac{\overline{z}}{z}$. [3]

(d) Show that the function $f(z) = z^2$ is not uniformly continuous on $\mathbb{C}$ whereas it is uniformly continuous on $\Delta_R = \{z : |z| < R\}$, where R is a fixed positive number. [3]

2(a) Show that if f is a real-valued function of a complex variable either has derivative zero or the derivative does not exist. [2]

(b) Show that if the complex valued function $f(z) = u(x, y) + iv(x, y)$ is differentiable at z_0, then the C-R equations must hold at $z_0 = x_0 + iy_0$. That is,

$$u_x(x_0, y_0) = v_y(x_0, y_0), \quad u_y(x_0, y_0) = -v_x(x_0, y_0).$$

Also, show that the converse is not true in generale. [5]

(c) Find the harmonic conjugate of $e^x \cos y + e^y \cos x + xy$. [3]

3(a) Show that if u and v are harmonic conjugates of each other in some domain, then u and v must be constants there. [2]

(b) It is given that $z + 2i = iz + k$, $k \in \mathbb{R}$ and $\frac{\omega}{z} = 2 + 2i$, $\text{Im}(\omega) = 8$. Find the value of k. [2]

(c) Find the value of t for which the function $100x + tyx^2 - y^3$ is harmonic. [2]

(d) Derive the C-R equations and the Laplace equation in polar form. [4]

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR
CS203 [Object Oriented Programming],
Autumn 2022-23, End Semester Examination
Time: 10:00 AM to 01:00 PM (180 minutes), Full marks: 50, Date: 29th October, 2022

INSTRUCTIONS:

- Attempt all the questions

Q. 1 (a) How is OOP helpful in the Office Automation system? State and give a real-life example on private and public access modifier. Q. (b) Why prototype function is a useful feature of the C++ programming language? What is meant by a prototype error in C++? Q. (c) Define Unary and Binary Operator. Write a C++ program to overload unary operators that is increment and decrement.	**4+2+4**
Q. (2) (a) State friend function and member function with the help of suitable examples. Give a real-world examples of friend functions. Q. (b) State Overloading and Overriding with the help of suitable examples. Give a real-life example of Overloading and Overriding. How do you explain the difference between overloading and overriding?	**4+6**
Q. (3) (a) How can we say that inline is one of the important features of C++. In what circumstances Compiler can ignore the request for inlining? Q. (b) State the difference between Class and Structure. Q. (c) State and differences between Classes and an Object with the help of suitable examples.	**4+2+4**
Q. (4) State the similarity and differences between pointer and variable with the help of suitable examples. What are some real-world applications of pointers in programming with examples? How do you think about pointers in C/C++? What are some practical applications of using pointers?	**10**
Q. (5) Discuss the differences between multiple and multilevel Inheritance with the help of suitable examples. What is the need of virtual base class? Is Virtual base classes are used in inheritance?	**10**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

CS203 [Object Oriented Programming],

Autumn 2022-23, Mid Semester Examination

Time: 03:00 PM to 05:00 PM (120 minutes), Full marks: 30, Date: 01st October, 2022

INSTRUCTIONS:

- Attempt all the questions

Q. 1 (a) How is OOP helpful in daily-to-daily life? How can a Smartphone be a real-life application of the concept of Object-Oriented Programming? Q. (b) Is it possible for a C++ program to be compiled without the main() function? Q. (c) When do we require an inline function? State its syntax with suitable example.	**5** **(2+3)+2+3**
Q. (2) Discuss the similarity and differences between: (a) Inheritance and Encapsulation (b) Class and Object (c) Overloading and Overriding (d) private, public and protected (e) OOP and POP	**10 (2*5)**
Q. (3) What is the use of constructors and how to use it? How many types of constructors exist in C++? Explain it with the help of suitable examples. Why copy constructor takes the parameter as a reference in C++?	**10**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR
CS201 [Design and Analysis of Algorithms],
Autumn 2022-23, End Semester Examination
Time: (180 minutes), Full marks: 50

INSTRUCTIONS:

- Attempt all questions.
- Marks for each question is mentioned.

1) **3+3+1+3**

A) Solve the following recurrence relation:
T(n) = 0 if n=0 or n=1
= Tn-1+Tn-2, otherwise.

B) Derive the average-case complexity of Linear search algorithm.

C) What do you mean by asymptotic efficiency? State Master's Theorem.

2) **4+3+3**

A) Derive the worst case and best-case complexity of Quick Sort algorithm.

B) Compare between Greedy approach and Dynamic Programming approach to solve a problem. Discuss Bellman Ford shortest path algorithm.

3) **5+5**

A) Find the optimal solution using greedy criteria for a knapsack having capacity 100 kg for the following list of items having values and weights as shown in the table.

Item	Value	Weight (kg)
I1	10	15
I2	20	25
I3	30	35
I4	40	45
I5	50	55

B) Discuss Kruskal's algorithm for finding minimum cost spanning tree and derive its Complexity.

4) **3+6+1**

A) Compare between backtracking and branch and bound approach. Discus the placement Of 4 Queens in a 4 × 4 chess board using the concept of N-Queen problem. (N=4)

B) What is chromatic number?

5) **6+4**

A) Define P, NP, NP hard and NP complete problems with examples.
B) Distinguish between Deterministic and Non-deterministic algorithm.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

CS201 [Design and Analysis of Algorithms],

Autumn 2022-23, Mid Semester Examination

Time: (120 minutes), Full marks: 30

INSTRUCTIONS:

- Attempt all questions.
- Marks for each question is mentioned.

1) A) Define Big "Oh" notation. Solve the following recurrence relation: T(n) = 0 if n=0 = 5 if n=5 = 3Tn-1+4Tn-2, otherwise. B) Derive the worst-case complexity of insertion sort algorithm. C) Derive the complexity of Merge sort using recursion tree method.	**4+3+3**
2) A) Write the recursive version of Binary search algorithm and analyze its performance. B) Compare between Divide and Conquer approach and Dynamic Programming approach to solve a problem. What is randomized Quick sort, Explain with example.	**6+4**
3) A) Write an algorithm to determine the cost of matrix multiplication. B) Derive the complexity for Dijksta shortest path algorithm. C) How Bellman Ford algorithm differs from Dijkstra algorithm. D) What is random access machine (RAM) model of computation.	**3+3+2+2**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Mid Semester Examination (Autumn Session: 2022-2023)

Subject: Measurement & Instrumentation (EC 209) **Maximum marks: 30**

Date: September 29, 2022 **Time: 10:00 to 12:00**

Instructor's Name: Dr. Sanjay Kumar

Instruction:

1. All questions are compulsory and should be answered in sequence manner.
2. Marks of the individual question is indicated on right side of question.
3. Scientific calculators are allowed. You may assume any missing data, citing reasons for such assumptions.
4. Do not write anything on the question paper.

---

1. (a) The power is measured in a resistor by passing current through the ammeter and ammeter measures I = (10± 5%) Amp across the resistance of R = (50 ± 4%) Ω. Find the power consumed by the resistor and its limiting error. [1+2]

   (b) A moving coil instrument gives the full-scale deflection of 20 mA when the potential difference across its terminals is 50 mV. Show how the instrument may be used to measure i) Voltage up to 500 V; ii) current up to 150 A. [2+2]

   (c) The inductance of a certain moving ammeter is $(5 + 20 - 60^2)$ nH, where θ is the deflection in radian from zero position. The control spring torque is 10×10^{-6} Nm/rad. Calculate the scale position in radian for current of 4 A. [3]

2. (a) The conductor of a cable has a diameter of 5 mm and the overall diameter of the cable is 50 mm. if the insulation resistance of the cable is 20 Ω/m. Calculate the specific resistance of the insulating material. [3]

   (b)Two resistors have the following ratings: $R_1 = (200 \pm 5)\ \Omega$ and $R_2 = (100 \pm 8)\ \Omega$, Determine the magnitude and limiting error of the resultant resistance when both are connected in parallel. [1+2]

   (c) Derive the expression for the deflection of a spring controlled permanent magnet moving coil instrument (with proper diagram). [4]

3. (a) A voltmeter of 1kΩ resistance and ammeter of 50 mΩ resistance are used to measure the unknown resistance by V-I method. If the voltmeter reads 40 V and ammeter reads 50 mA in both cases, calculate the percentage error if

   (i) The voltmeter is kept across the resistance and ammeter is connected in series with supply voltage. [2]

   (ii) The ammeter is kept series with the resistance and voltmeter is connected in parallel with supply voltage. [2]

   (b) A Maxwell's capacitance bridge method is used to measure the unknown inductance. The various values at balance $R_2 = 400\Omega$; $R_3 = 500\Omega$; $R_4 = 1k\Omega$ and $C_4 = 0.5\ \mu F$. Calculate the value of R_1 and L_1. [2+2]

   (c) Write the difference between Voltmeter and Ammeter. [2]

"आपसे अनुरोध है कि इस प्रश्न का उत्तर हिंदी में दें। यदि आप हिंदी में कुछ शब्दावली नहीं जानते हैं, तो आप अंग्रेजी संस्करण रख सकते हैं।".

Indian Institute of Information Technology Bhagalpur 813210

Department of Electronics & Communication Engineering
End Semester, April 2023

B. Tech. 2nd Year- ECED & CSED, Semester IV

Subject: EC208: Microprocessor & Interfacings

Date: April 24, 2023 | Duration: 180 Minutes | Maximum Marks: 50

Instructions: *Assume necessary data wherever required.*
Draw appropriate figure wherever necessary.
Figures in the right margin indicate marks.

1. a) Given that BX = 2500H, SI = 5000H, Displacement = 1000H, IP = 2000H [3]
Determine the effective address for the following addressing modes:
i) Immediate
ii) Base Index
iii) Index

b) Explain in detail the coding templates for MOV instruction of 8086. [2]

c) Draw the block diagram of 8086 and explain the functions of general-purpose registers (GPRs). [4]

d) How many bytes can be stored in the queue of 8086? [1]

2. a) While executing a program, when the 8085 MPU completes the fetching of the machine code located at the memory address 2057H, what is content of the program counter? [1]

b) i) Write an assembly language program to convert a given 8-bit binary number into a Gray code. [4]

ii) Write an assembly language program to find two's complement of an 8-bit number.

c) Draw the flag register of 8086. [1]

d) Write a program to use Counter 1 of 8254 in mode 3 as a square wave generator. Assume N = 12. The counter operates as a binary counter. [4]

3. a) The two machine codes - 00111110 (3EH) and 00110010 (32H) are stored at memory locations 2000H and 2001H respectively. The first machine code (3EH) represents the opcode, and the second code (32H) is the data to be loaded into the accumulator. If the clock frequency is 2 MHz, draw the timing diagram and calculate the time required to execute the opcode fetch and memory read cycles. [4]

b) Which steps 8086 follows to handle any interrupt. What do you mean by NMI interrupt? [3]

c) Illustrate the data flow and list the sequence of events when 1- byte instruction is fetched by the microprocessor unit. [3]

4. a) What are the two modes of 8086? Draw the pin diagram of the 8086 micro-processor. [2]

b) Design a seven-segment LED output port with the device address F5H, using a 74LS138 3-to-8 decoder, a 74LS20 4-input NAND gate, a 74LS02 NOR gate, and a common-anode seven-segment LED to display letter "7". [4]

c) Explain Programmable Peripheral Interface (PPI) 8255 with suitable block diagram. What should be the control word if Port A and Port B are to be configured as input and Port C_{lower} and Port C_{upper} have to be configured as output ports. Assume mode to be Mode 0. [4]

भारतीय सूचना प्रौद्योगिकी संस्थान भागलपुर

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Signals & Systems [EC-202]

Spring 2022-23 (END Semester Examination)

Time: 8:00 AM to 11:00 AM Full marks: 50 Date: 26-04-2023

INSTRUCTIONS

- Attempt all questions.

1) (a) Define energy signal and power signal. With proper justification, determine whether the given signal is energy or power signal? [5+5]

$$x[n] = \left(\frac{1}{7}\right)^n u[n]$$

(b) Input $x(n)$ and output $y(n)$ of a system is related by

$$y(n) = x(n-4) + x(2-n)$$

Determine whether the given system is linear or non-linear, static or dynamic, causal or non-causal? Plot the output of the system when the input is unit step function.

2) (a) How impulse response is used to get the output of an LTI system for a given input? Explain. If impulse response $h(n)$ of a system is given by [5+5]

$$h[n] = \left(-\frac{1}{7}\right)^n u[n]$$

Find unit step-response of the system.

(b) Define DTFT of the given signal x(n). Prove the differentiation property of the DTFT.

3) (a) Find DTFT of the following sequence [4+6]

$$x(n) = \left(\frac{1}{3}\right)^n u[n+4]$$

(b) Write differences between DTFT and DFT? Find the 4-point DFT of the following sequence:

$$x(n) = \{1, 2\}$$

4) (a) Prove the time-shifting property of the Z-transform. Find the Z-transform and ROC of the following signal [5+5]

$$x(n) = \left(\frac{1}{2}\right)^n u[n-1]$$

where, $u[n]$ denotes the unit-step function.

(b) Find the Z-transform and sketch the pole-zero plot of ROC of the following sequence:

$$x[n] = \left(\frac{1}{3}\right)^n u[n] - \left(\frac{1}{5}\right)^n u(-n-1)$$

5) (a) Find inverse Z-transform of X(z) using partial fraction expansion method. [5+5]

$$X(z) = \frac{z(z+3)}{z^2+3z+2} \quad ; |z| > 2$$

(b) What are differences between Z-transform and Laplace transform. Find Laplace transform and ROC of the following signal

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

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

EC203 [Analog Electronics]

Spring 2022-23, End Semester Examination

Time: 08:00AM to 11:00AM, Date: 27th April, 2023

Full Marks: 50

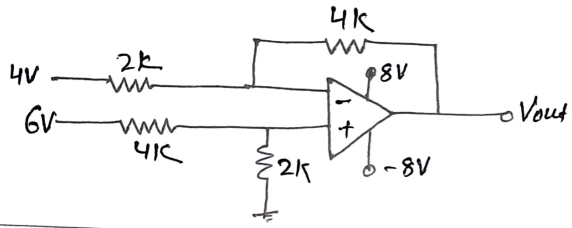
INSTRUCTIONS:

- Answer all the questions.
- Draw neat and clean diagram with proper leveling.
- Use of mobile is not allowed. You may use scientific calculator for calculation purpose only.
- Write roll no. and name on each page of the extra sheet, if taken.

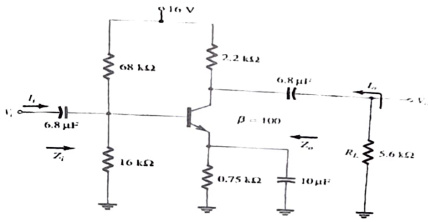
1) Answer the following questions. — **04+06 = 10 Marks**

a) Draw the small signal equivalent circuit of Inverting and Non-Inverting operational amplifier, and determine their input & output impedances.

b) For the given circuit, determine the value of differential gain (A_{di}), common mode gain (A_{CM}), and CMRR.



2) For the circuit as shown in Figure. — **04+04+02 = 10 Marks**

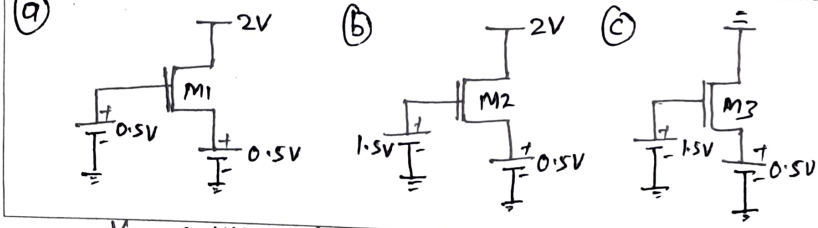


a) Draw the ac and dc equivalent circuits.

b) Sketch the two-port model and find the input-output impedance.

c) What is the significance of bypass and coupling capacitors in CE amplifier?

3) Determine the region of operation of MOS transistors in each of the circuit shown. — **10 Marks**



$V_{THN} = 0.4V$, $V_{THP} = -0.4V$

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

MA203 (Probability and Statistics)

MIDSEM 2022-23 Spring

Max. Marks: 50 **Time:** 3.00 hours **Date of Exam:** 28-04-2023

1)

a) If X is a random variable having Poisson distribution with mean λ, then show that $E(X^3) = \lambda^3 + 3\lambda^2 + \lambda$. [4 marks]

b) A taxi cab company has 12 Ambassadors and 8 Fiats. If 5 of these taxi cabs are in the shop for repairs what is the-probability that at least 3 of them are Ambassadors? [3 marks]

c) Using normal distribution approximately find the find the probability of at least 60 heads if a fair coin is tossed 90 times. [3 marks]

2)

a) Find the correlation coefficient for the two random variables X and Y whose joint density function is given as $f(x,y) = \begin{cases} x+y & ,if\ 0 \le x,y \le 1 \\ 0 & otherwise \end{cases}$ [5 marks]

b) If two random variables X and Y whose joint density function is given as

$$f(x,y) = \begin{cases} 4xy & ,if\ 0 \le x,y \le 1 \\ 0 & otherwise \end{cases}$$ [5 marks]

and $Z = Y^2$ and $W = XY$, then find the joint density function of $g(z,w)$ of Z and W.

3)

a) Measurements of the diameters of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 0.824 inch and a standard deviation of 0.042 inch. Find (i) 95%, (ii) 99% confidence intervals for the mean diameter of all the ball bearings. [4 marks]

b) A sample of 20 brand A light bulbs showed a mean lifetime of 1400 hours and a standard deviation of 120 hours. A sample of 15 brand B light bulbs showed a mean lifetime of 1200 hours and a standard deviation of 80 hours. Find (i) 95%, (ii) 99% confidence limits for the difference of the mean lifetimes of the populations of brands A and B. [3+3 marks]

4)

a) A new curing process developed for a certain type of cement results in a mean compressive strength of 5000 kilograms per square centimeter with a standard deviation of 120 kilograms. To test the hypothesis that $\mu = 5000$ against the alternative that $\mu < 5000$, a random sample of 50 pieces of cement is tested. The critical region is defined to be $x < 4970$. Find the probability of committing a type I error. Also, find the probability of committing a type II error for the alternative $\mu = 4960$. [3+3 marks]

b) For testing: [4 marks]

$$H_0: \mu = 14,$$
$$H_A: \mu \neq 14,$$

an $\alpha = 0.05$ level t-test is being considered. What sample size is necessary in order for the probability to be 0.1 of falsely failing to reject H_0 when the true population mean differs from 14 by 0.5? From a preliminary sample we estimate σ to be 1.25.

5)

Height x of Father (inches)	65	63	67	64	68	62	70	66	68	67	69	71
Height y of Son (inches)	68	66	68	65	69	66	68	65	71	67	68	70

[3+3+4 marks]

Find regression lines i) $y = ax + b$ ii) $x = cy + d$ iii) $y = ax^2 + bx + c$

----------x----------

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

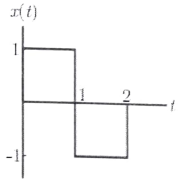
Digital Communication (EC-204)

Spring 2022-23, End Semester Examination

Time: 08:00 **AM to** 11:00 AM **(180 minutes), Full marks: 50, Date: 29-04-23**

INSTRUCTIONS: All the questions are mandatory. Symbols have their usual meanings.

"आपसे अनुरोध है कि किसी एक प्रश्न का उत्तर हिंदी में दे सकते हैं । यदि आप हिंदी में कुछ शब्दावली नहीं जानते हैं, तो आप अंग्रेजी संस्करण रख सकते हैं।"

1.a) Prove that the channel capacity C of a band limited channel of bandwidth B is C=B*log(1+S/N). b) Find out the percentage change in (B/C) if S/N changes from 10dB to 13dB.	**7+3=10**
2. a) What is entropy? If a source emits messages $m_1, m_2, \ldots m_n$ with probabilities $p_1, p_2, \ldots, p_n$ then what is the maximum entropy. b) A signal amplitude x is a random variable uniformly distributed in the range (-1,1). The signal is passed through an amplifier of gain 2. The output y is also a random variable, uniformly distributed in the range (-2,2). Determine the entropies H(x) and H(y). c) Find out the Nyquist sampling frequency of $x(t)=3\cos^2(400*t)$.	**3+5+2=10**
3. a) A signal x(t) with the following fig. is applied to a matched filter. Then find out the transfer function h(t) of the filter and also the output you will get from the matched filter.  b) Draw the representation of 110101 using polar RZ and Bipolar NRZ.	**7+3=10**
4 a) Derive the error probability of FSK using the signal space diagram. b) Compare the error probabilities of QPSK and BPSK.	**6+4=10**
5. a) Consider a binary digital communication system with equally likely 0's and 1's. When binary 0 is transmitted the detector input is between the levels −0.22V and +0.22V with equal probability. When binary 1 is transmitted, the voltage at the detector can have any value between 0 and 1 V with equal probability. If the detector has a threshold of 0.15V (i.e., if the received signal is greater than 0.15 V, the bit is taken as 1), then find the average bit error probability. b) Draw the transmitter and receiver blocks of Delta modulation.	**7+3=10**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Analog Communication (EC-207)

Autumn 2022-23, Mid Semester Examination

Time: 10:00 AM to 12:00 NOON (120 minutes), Full marks: 30, Date: 28-09-22

INSTRUCTIONS: All the questions are mandatory.

1. a) The incoming frequency of a superheterodyne receiver is 1310 KHz. The Intermediate frequency of the receiver is 465 KHz. Then find out the frequency of the image station. **2+2+3+3=10**

b) The peak amplitude of an AM signal varies from 1 volt to 7 volt. Then what is the amplitude of the carrier?

c) An SSB-SC signal has been generated using a carrier of 900 KHz. The message signal is $m(t)=\cos(200\pi t)+2\sin(2000\pi t)$. Find out the SSB-SC signal.

d) Draw and explain the block diagram of communication system.

2. a) If the Hilbert transform of m(t) is $m_h(t)$ then find out the Hilbert transform of $m_h(t)$. **3+5+2=10**

b) Sketch the Amplitude modulated signal for $m(t)=4\sin(100\pi t)$ and carrier signal as $4\cos(10000\pi t)$. Also find out the side band power and the total power.

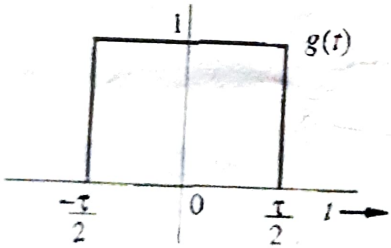
c) Explain the disadvantages of DSB-SC signal.

3. a) A Fourier series has been expressed in the following **4+3+3=10**

$$g(t)=3\cos t+\cos(5t-2\pi/3)+2\cos(8t+2\pi/3)$$

Find its amplitude and phase spectrum.

b) Find out the Fourier transform of the following signal



c) Draw and explain the Envelope Detector circuit.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

EC201 [Electromagnetic Theory],

Autumn 2022-23, Mid Semester Examination

Time: 10:00 AM to 12:00 NOON (120 minutes), Full marks: 30, Date: 26th September, 2022

INSTRUCTIONS:

- All the questions are compulsory but it should be answered sequentially in answer-sheet.
- All the questions need all necessary steps for full credit.
- Any page used for rough work must have a heading **Rough Work**. This page will **NOT** be evaluated.
- Don't write anything on the question paper.

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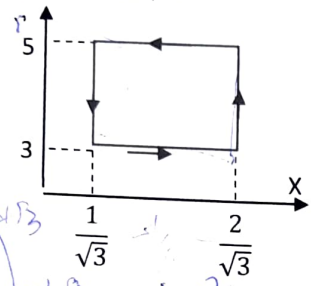
1) a) What is Curl of Vector. Discuss its physical meaning with suitable diagram. Derive its mathematical expression. **7+3**

b) If $\vec{B} = xy\,\hat{\imath} + x^2\,\hat{\jmath}$, then find the value of close line integral $\oint \vec{B}\,.\,\vec{dl}$ over the path as shown in Figure (given below) is



2) a) Derive Maxwell Equations. Write its differential and integral form. Also, explain physical meaning of each equation. **7+3**

b) Prove that $\vec{E} = -\nabla V$

3) a) Derive the vector transformation matrix between cylindrical and spherical coordinates: **7+3**

$$\begin{vmatrix} \vec{A}_r \\ \vec{A}_\theta \\ \vec{A}_\phi \end{vmatrix} = \begin{vmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{vmatrix} \begin{vmatrix} \vec{A}_\rho \\ \vec{A}_\phi \\ \vec{A}_z \end{vmatrix}$$

b) Transform the vector $\vec{B} = x\,\hat{\imath} + y\,\hat{\jmath} + z\,\hat{k}$ into cylindrical coordinates.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Department of Electronics and Communication Engineering

End-Semester Examination
(Autumn Semester, 2022-2023)

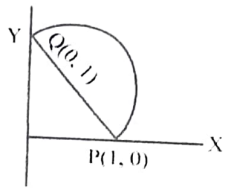
Course Name: Electromagnetic Theory (EC-201)
Date: 01 December, 2022
Instructor Name: Dr. Prakash Ranjan

Maximum Marks: 50
Time: 10:00AM to 01:00PM
Duration: 03 Hrs

Instructions

- All the questions are compulsory but it should be answered sequentially in answer-sheet.
- All the questions need all necessary steps for full credit.
- Any page used for rough work must have a heading **Rough Work**. This page will **NOT** be evaluated.
- Don't write anything on the question paper.

Q.1 (a) Consider points P and Q in the x-y plane, with P = (1, 0) and Q = (0, 1). The value of line integral $I = \int_P^Q (xdx + ydy)$ along the semicircle with the line segment PQ is: **[2]**



(b) State and prove Stokes Theorem. **[8]**

Q.2 (a) Write notes on magnetic scalar and vector potential. **[2]**

(b) Derive the Maxwell Equation's. What is the limitation of Maxwell Equation's in its differential form? Also, discuss the physical meaning of each equation. **[5]**

(c) Two extensive homogeneous isotropic dielectric meet on plane z=0. **[3]**
Given: for $z > 0$, $\epsilon_{r1} = 4$ and for $z < 0$, $\epsilon_{r2} = 3$ and
a uniform electric field $\overrightarrow{E_1} = 5\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ *kv/m* exist for $z > 0$.
Find: (i) $\overrightarrow{E_2}$ for $z < 0$ (ii) Energy Densities in both the dielectrics

Q.3 Derive the Wave-Equation for electromagnetic fields and discus its solutions in detail for a medium which is unbounded, Isotropic, Homogeneous and Source-free. With the obtained expression of electromagnetic waves (forward and backward waves) derive the Intrinsic Impedance (for both forward and backward waves) of medium in which wave is propagating. **[10]**

Q.4 (a) A positive point charge Q is located at distances d1 and d2, respectively, from two grounded perpendicular conducting half-planes, as shown in the figure. Determine the force on Q caused by the charges induced on the planes. **[3]**

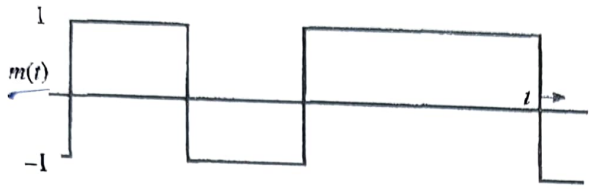
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Analog Communication (EC-207)

Autumn 2022-23, End Semester Examination

Time: 10:00 AM to 1:00 PM (180 minutes), Full marks: 50, Date: 30-11-22

INSTRUCTIONS: All the questions are mandatory.

1. a) Find out and sketch properly the Frequency modulated and phase modulated signals for m(t) given below. The constants are $k_f = 2\pi 10^5$, $k_p = \frac{\pi}{2}$ and the carrier frequency fc=100 MHz.  .b) Draw and explain the circuit of Band pass limiter.	6+4=10
2. a) Design the indirect Armstrong FM modulator to generate the FM carrier with frequency 98.1 MHz and Δf =75KHz. A narrow band FM with carrier frequency 100kHz and Δf =10 Hz is already available. You can use frequency multipliers of doublers (2), triplers (3) and quinteplers (5) only. b) A 10 KW carrier is used to generate a frequency modulated signal with $\beta = 0.8$. Find out the power of the transmitted signal.	7+3=10
3. a) The modulated signal to the envelope detector with Resistor R and Capacitor C is $V(t) = A_c(1 + m\cos\omega_m t)\cos\omega_c t$. With proper derivation find out the time constant RC of the detector to follow the message envelope properly. Here, m is the modulation index. b) Find out the Fourier transform of the following signal $g(t) = 2\cos(2\pi f_0 t + \theta_1)\sin(2\pi f_0 t + \theta_2)$	6+4=10
4. a) Find out the effect of noise on DSB-SC and SSB-SC and compare their signal to noise ratio. b) If $m(t) = e^{-t^2}$, $k_f = 6000\pi$, $k_p = 8000\pi$ and fc=10^4 Hz, then find out the frequency deviation of FM and PM.	6+4=10
5. a) A message signal of Bandwidth 10 KHz is lower single side band (SSB-SC Lower side band) modulated with carrier frequency (fc)=1 MHz. The resultant signal is then passed through a narrow band FM modulator with fc=1 GHz. With proper sketch, find out the bandwidth of the output signal. b) Draw and explain the circuit of a superheterodyne receiver.	6+4=10

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

End Semester Examination (Autumn Session: 2022-2023)

Subject: Measurement & Instrumentation (EC 209) **Maximum marks: 50**

Date: December 02, 2022 **Time: 10:00 to 13:00**

Instructor's Name: Dr. Sanjay Kumar

Instruction:

1. **All questions are compulsory and should be answered in sequence manner.**
2. **Marks of the individual question is indicated on right side of question.**
3. **Scientific calculators are allowed. You may assume any missing data, citing reasons for such assumptions.**
4. **Do not write anything on the question paper.**

---

1. (a) What is an LVDT? Explain its working principle with necessary diagrams and characteristics. [4]
   (b) Explain the construction of wire wound strain gauges and derive the expression for the gauge factor. [2+2]
   (c) The resistance of a thermistor is 500 Ω at 40°C and 5 kΩ at the ice-point. Calculate the characteristic constants (A, B) for the thermistor. [2]

2. (a) Draw the block diagram of a CRO and explain the different components. [3]
   (b) Derive an expression for the vertical deflection on the screen of a CRT in terms of length of plates, separation distance, accelerating voltage and distance of screen from the origin. [4]
   (c) In a CRT, the distance between the deflecting plates is 1.0 cm, the length of the deflecting plates is 4.5 cm and the distance of the screen from the centre of the deflecting plates is 33 cm. If the accelerating voltage supply is 300 Volt, calculate deflecting sensitivity of the tube. [3]

3. (a) An electrodynamometer-type wattmeter has a current coil with a resistance of 0.1 Ω and a pressure coil with resistance of 6.5 kΩ. The load is specified as 12 A at 250 V with unity power factor. Calculate the percentage errors while the meter is connected as (i) current coil to the load side, and (ii) pressure coil to the load side. [3+3]
   (b) A 220 V, 5A Energy Meter on full load unity power factor test makes 50 revolutions in 360 seconds. If the designed speed of the disc is 500 revolutions per kWh, find the percentage error. [4]

4. (a) Explain the principle of Loss of Charge Method for Measurement of high resistance. [3]
   (b) In Loss of Charge Method, an electrostatic voltmeter is connected between the cable conductor and earth. This combination is found to form a capacitance of 800 pF between the conductor and earth. It is observed that after charging the cable with 500 V or sufficiently long time, when the voltage supply is withdrawn, the voltage drops down to 160 V in 1 minute. Calculate the insulation resistance of the cable. [3]
   (c) The voltage 10cos ωt and Vcos (ωt + α) are applied to the X and Y plates of a CRO. The Lissajous figure observed on the screen is a straight line of 60° to the positive axis. Then, find the value of V and ω. [4]

   "आपसे अनुरोध है कि प्रश्न (५) का उत्तर हिंदी में दें। यदि आप हिंदी में कुछ शब्दावली नहीं जानते हैं, तो आप अंग्रेजी संस्करण रख सकते हैं।".

5. (a) Write the difference between Sensor and Transducer. [2]
   (b) Explain Spring and Gravity Control in controlling system. [3]
   (c) Write the difference between absolute and secondary instruments. [2]
   (d) How the Voltage/Current range of a PMMC instrument can be extended? [3]

भारतीय सूचना प्रौद्योगिकी संस्थान भागलपुर

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Signals & Systems [EC-202]

Spring 2022-23 (Mid Semester Examination)

Time: 11:00 AM to 1:00 PM **Full marks: 30** **Date: 11-03-2023**

INSTRUCTIONS:

- Attempt all questions.
- "आपसे अनुरोध है कि किसी एक प्रश्न का उत्तर हिंदी में दें। यदि आप हिंदी में कुछ शब्दावली नहीं जानते हैं, तो आप अंग्रेजी संस्करण रख सकते हैं।".

1.

a. If x[n]= {1, 3, 2, 5, 7}, find even and odd components of x(n) and show it using graphical representation. **[3+4+3]**

b. A discrete-time signal x[n] is given by x[n]= {1, 2, 3,3}.

Sketch the following signal using graphical representation

(i) x[n-2] (ii) x[n+2]

c. With proper justification, determine whether the given signal x[n] is energy signal or power signal

$$x[n] = e^{j\left(\frac{\pi}{2}n+\frac{\pi}{2}\right)}$$

2.

a. Define stable and unstable systems. Test the stability of a system whose impulse response is given by **[4+2+4]**

$$h[n] = 2^{-n}\, u[-n]$$

b. What do you mean by Dirichlet's condition?

c. Find Fourier transform of the following signal

$$x(t) = e^{-3t}[u(t+3) - u(t-2)]$$

3.

[2+3+5]

a. How Fourier transform is different from Fourier series?

b. Find convolution sum of the following sequences using matrix method:

$$x(n)=3\delta(n+1)-\delta(n)+\delta(n-1)+2\delta(n-2)$$

$$h(n)=4\delta(n-1)+2\delta(n-2)+3\delta(n-3)$$

c. Find Fourier transform of the following signal and sketch its magnitude and phase spectrum:

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

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

CS204, Database Management Systems,

Spring 2023, Fourth Semester, End-Semester Examination

Time: 8:00 AM to 11:00 AM (180 minutes), Full marks: 50, Date: 25th April, 2023

INSTRUCTIONS:

- Answer to the questions in order and to the point.
- Assume the missing data suitably and mention the same.

1. a. Explain DBMS overall system architecture. b. What are the major advantages of database management systems over traditional file system? c. What is an entity, instance, schema and Entity-Relationship (ER) model in database systems.	**4+3+3**
2. a. Write ER diagram and database schema (with proper Referential Integrity Constrains) for Company Database b. Consider the relational database schema as shown below: Give an expression in the relational algebra to express each of the following queries: ***employee (employee_id, name, date_of_birth, address, salary, dept_No)*** ***project (project_No, project_name, project_location, dept_No)*** i. List the name and salary of all the employees. ii. Retrieve the Name and Salary of all employees who are working for department 1. iii. Find the employees who work for department 3 and whose salary is greater than Rs. 30000. iv. List the name and location of the projects which are not controlled by department 2.	**5+5**
3. a. Consider the relational database schema as shown below: ***professor (emp_id, emp_name, start_year, phone_No, dept_No)*** ***department (dept_No, dept_name, HoD_empid, phone_No)*** ***Courses (Course_id, course_name, credits, dept_No)*** ***Slove the following by expressing in terms relational algebra with proper given join operations.*** i. For each department, find the name and phone number of the head of the department. (**Solve by using theta join**). ii. Find courses offered by each department. **(Solve by using Equi join).** b. Differentiate between relational algebra and tuple relational calculus. c. Explain conversion of ER diagrams to Relational Schema for the following cases: case 1: When ER diagram has any weak entity. case 2: When ER diagram has 1:1 binary relationship.	**4+2+4**
4. a. What is Normalization? Why it is required in database systems?	**2.5+5+2.5**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR
CS204/CS552, Database Management Systems/Advanced Database Systems,
Spring 2023, Mid Semester Examination
Time: 15:00 PM to 17:00 PM (120 minutes), Full marks: 30, Date: 6th March, 2023

INSTRUCTIONS:

- Answer to the questions in order and to the point.
- Assume the missing data suitably and mention the same.

1. a. What are the major disadvantages of traditional file system based data storage over DBMS?. **2.5+2.5+5**
   b. Explain different types of DBMS users.
   c. Explain DBMS overall system architecture.

2. a. Write ER diagram and database schema for Institute Database System. **5+5**
   b. Consider the relational database schema as shown below: where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries:
   employee (<u>employee-name</u>, street, city)
   works (<u>employee-name</u>, company-name, salary)
   company (<u>compnay-name</u>, city)
   manages (<u>employee-name</u>, manager-name)
   i. Find the names of all employees who work for **"Star Telecom"** company (**"Star Telecom"** is a company name).
   ii. Find the names and cities of residence of all employees who work for **"Star Telecom"** company.
   iii. Find the names, street address, and cities of residence of all employees who work for **"Star Telecom"** company and earn more than Rs. 9,00,000 per annum.

2. a. Consider the given relations: **3+3+4**

R1

EMP NAME	STREET CITY	CITY
Kumar	Civil line	Mumbai
Vinay	Park street	Kolkata
Surya	M.G. Street	Delhi
Uday	Nehru nagar	Hyderabad

R2

EMP NAME	BRANCH	SALARY
Kumar	Infosys	75000
Shyam	Wipro	74000
Krishna	HCL	70000
Uday	TCS	76000

Find i. R1 ⋈ R2, ii. R1 ⟕ R2, iii. R1 ⟖ R2

b. Explain procedural query language and declarative query language with examples.

c. Consider the relational database schema as shown below. Give an expression in the tuple relational calculus (TRC) to express each of the following queries:
student (<u>rollno</u>, name, degree, year, gender, deptNo, advisor)
department (<u>deptId</u>, name, hod, phone)
enrollment (<u>rollno, coursId, sem, year</u>, grade)
teaching (<u>empId, coursId, sem, year</u>, classRoom)

i. Get the names of students who have taken at least one course taught by their advisor.

ii. Display the departments whose HoD's are teaching at least one course in the current semester.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

CS204/CS552, Database Management Systems/Advanced Database Systems,

Spring 2023, Mid Semester Examination

Time: 15:00 PM to 17:00 PM (120 minutes), Full marks: 30, Date: 6th March, 2023

INSTRUCTIONS:

- Answer to the questions in order and to the point.
- Assume the missing data suitably and mention the same.

1. a. What are the major disadvantages of traditional file system based data storage over DBMS?. **2.5+2.5+5**
   b. Explain different types of DBMS users.
   c. Explain DBMS overall system architecture.

2. a. Write ER diagram and database schema for Institute Database System. **5+5**
   b. Consider the relational database schema as shown below: where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries:
   employee (<u>employee-name</u>, street, city)
   works (<u>employee-name</u>, company-name, salary)
   company (<u>compnay-name</u>, city)
   manages (<u>employee-name</u>, manager-name)
   i. Find the names of all employees who work for **"Star Telecom"** company (**"Star Telecom"** is a company name).
   ii. Find the names and cities of residence of all employees who work for **"Star Telecom"** company.
   iii. Find the names, street address, and cities of residence of all employees who work for **"Star Telecom"** company and earn more than Rs. 9,00,000 per annum.

3. a. Consider the given relations: **3+3+4**

R1

EMP NAME	STREET CITY	CITY
Kumar	Civil line	Mumbai
Vinay	Park street	Kolkata
Surya	M.G. Street	Delhi
Uday	Nehru nagar	Hyderabad

R2

EMP NAME	BRANCH	SALARY
Kumar	Infosys	75000
Shyam	Wipro	74000
Krishna	HCL	70000
Uday	TCS	76000

Find i. R1 ⋈ R2, ii. R1 ⟕ R2, iii. R1 ⟖ R2

b. Explain procedural query language and declarative query language with examples.

c. Consider the relational database schema as shown below. Give an expression in the tuple relational calculus (TRC) to express each of the following queries:
student (<u>rollno</u>, name, degree, year, gender, deptNo, advisor)
department (<u>deptId</u>, name, hod, phone)
enrollment (<u>rollno, coursId, sem, year</u>, grade)
teaching (<u>empId, coursId, sem, year</u>, classRoom)

i. Get the names of students who have taken at least one course taught by their advisor.

ii. Display the departments whose HoD's are teaching at least one course in the current semester.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

EC 203 [Analog Electronics]

Spring 2022-23, Mid Semester Examination

Time: 03:00 PM to 05:00 PM, Date: 05th March, 2023

Full Marks: 30

INSTRUCTIONS:

- Answer all the questions.
- Draw neat and clean diagram with proper leveling.
- Use of mobile and calculators are not allowed.
- Write roll no. and name on each pages of the extra sheet, if taken.

1) Answer the following questions.

a) Fill in the blanks

(i) Ideal Operational Amplifier should have _____ Bandwidth, and _____ CMRR.

(ii) Ideal Operational Amplifier should have _____ Input impedance, and _____ output impedance.

(iii) Schmitt Trigger is _____ feedback circuit which generates _____ signal.

(iv) Multivibrator oscillates between _____ states and produces continuous output which is known as _____ pulse generator at _____ frequency.

(v) Schmitt Trigger is _____ feedback circuit which generates _____ signal.

b) Draw neat and clean RC phase shift oscillator using OPAMP, and write down the working and principle.

05+03 = 08 Marks

2) Answer the following questions.

a) Define Amplifier and write down types of Analog amplifiers.

b) Draw the non-ideal equivalent circuits of all the Analog amplifiers, and determine the input & output Impedance, and gain expressions.

c) Draw the circuits of Inverting and Non-Inverting operational amplifier, and sketch voltage transfer characteristics (VTC) of both the OPAMPs.

02+06+04 = 12 Marks

3) Answer the following questions.

a) Sketch Astable Multivibrator circuit using 555 timer and draw the output waveform.

b) Derive the expression of charging and discharging time of Astable multivibrator.

c) Draw neat and clean Bistable Multivibrator using 555 timer, write down the working and principle and sketch the output waveform.

03+04+03 = 10 Marks

** **All the Best for Mid Semester examination** **

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR

Digital Communication (EC-204)

Spring 2022-23, Mid Semester Examination

Time: 15:00 to 17:00 (120 minutes), Full marks: 30, Date: 03-03-23

INSTRUCTIONS: All the questions are mandatory.

"आपसे अनुरोध है कि किसी एक प्रश्न का उत्तर हिंदी में दे सकते हैं । यदि आप हिंदी में कुछ शब्दावली नहीं जानते हैं, तो आप अंग्रेजी संस्करण रख सकते हैं।"

1.a) What is Intersymbol Interference (ISI)? Suggest a procedure for reducing it. b) A certain channel has ideal amplitude, but non ideal phase response given by $\lvert H(\omega)\rvert = 1$ $\theta_h(\omega) = -\omega t_0 - k\sin(\omega T)$ Show that for an input pulse g(t) which is band limited to B Hz, the channel output y(t) is $$y(t) = g(t - t_0) + \frac{k}{2}[g(t - t_0 - T) - g(t - t_0 + T)]$$ Assume k<<1. What is the effect of the channel on the output y(t)?	**4+6=10**
2. a) Draw and Explain the transmitter and receiver circuits of DPCM. b) Find out the Nyquist sampling rate for the signal $$s(t) = \frac{\sin(500\pi t)}{\pi t} \times \frac{\sin(700\pi t)}{\pi t}$$ c) If the number of bits/sample for the PCM system has been increased from n to n+2, then find out the change in the signal to quantization noise ratio in dB.	**4+4+2=10**
3. a) 3 signals having bandwidth B, 2B and 3B Hz are frequency division multiplexed using DSB-SC, DSB-SC and SSB-SC modulation schemes with carrier frequencies fc1, fc2, fc3 respectively. Find out the condition for which there will be no overlapping. b) A signal g(t) is band limited to B Hz. The signal is sampled using Nyquist sampling time interval Ts i.e Ts=1/2B. The samples of g(t) are g(0)=1, g(Ts)=1, g(2Ts)=g(3Ts)=.....=0. Then find the signal g(t). c) Find out the condition for avoiding slope overload in delta modulation.	**4+4+2=10**

भारतीय सूचना प्रौद्योगिकी संस्थान भागलपुर
Indian Institute of Information Technology Bhagalpur
Department of Electronics & Communication Engineering

Mid Semester, Spring 2023
B. Tech. 2nd Year, Semester IV
Subject: EC208 Microprocessor & Interfacing

Date: March 04, 2023 **Duration: 120 Minutes** **Maximum Marks: 30**

Instructions: *Draw appropriate figure wherever necessary.*
Assume necessary data wherever required.
Figures in the right margin indicate marks.

1 a) Illustrate the data flow and list the sequence of events when the instruction is fetched by the microprocessor unit. [4]

b) Draw the block diagram of 8086 and explain the functions of general-purpose registers (GPRs). [5]

c) Calculate the number of address lines required for an 8K-byte memory chip. [1]

2 a) What are the two modes of 8086? List out various pins associated exclusively with these two modes respectively. [3]

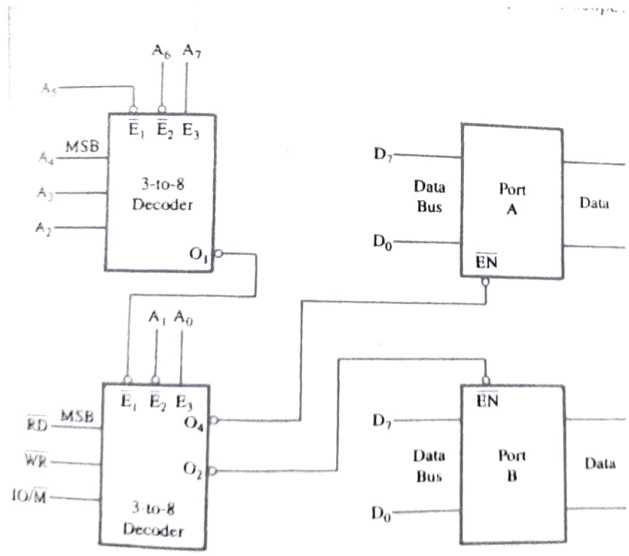
b) Mention the status of the carry, auxiliary carry and parity flag, if following instructions are executed. [3]
MOV A, #9CH;
ADD A, #64H

c) Two machine codes – 00111110 (3EH) and 00110010 (32H) are stored in memory locations 2000H and 2001H, respectively. The first machine code (3EH) represents the opcode to load a data byte in the accumulator, and the second code (32H) represents the data byte to be loaded in the accumulator. Draw the bus timing diagram and calculate the time required to execute the Opcode Fetch and Memory Read cycles if the clock frequency is 2 MHz. [4]

3 a) Determine the effective address for the following addressing modes: [2]
i) Immediate addressing ii) Based Indexed addressing
(BX = 2500H, SI = 5000H, Displacement = 1000H, IP = 2000H)

b) Write an assembly language program to realize the NOR gate. [4]

c) In Figure shown below, what are the addresses of ports A and B. Also specify ports A and B as input or output port. [4]



Name: **Institute Roll No.:**

********** ********** Wish you all the best **********