

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
MID SEMESTER EXAMINATION, SESSION: 2022-2023 (SPRING SEMESTER)
Program: B. Tech **Semester: IV (Section B)** **Department: ECE**
Course Code: EC 45103 **Course Name: Digital Signal Processing**
Full Mark: 30 **Time: 2 hrs**

Attempt all questions.

- 1) Compute the 4-point Discrete Fourier Transform (DFT) of the sequence $x(n) = \cos(\pi n)$. [3]
- 2) Let $X(k)$ be the 10-point Discrete Fourier Transform (DFT) of the sequence $x(n) = \delta(n) + 2\delta(n-5)$. Consider another sequence $y(n)$ whose DFT is given by $Y(k) = X(k)e^{-j\frac{2\pi}{10}7k}$. Find the sequence $y(n)$. [5]
- 3) Let a sequence $x(n) = \{2, 5, 0, 4\}$ is applied to system having impulse response $h(n) = \{4, 1, 3\}$. Find the response of the system to the input $x(n)$ using circular convolution. [5]
- 4) Compute 4 point DFT of a sequence $x(n) = \{1, 2, 3, 4\}$ using decimation in time fast Fourier transform (DIT-FFT) algorithm and draw the Butterfly diagram. [6]
- 5) Let impulse response of a filter is given by $h(n) = 0.8\delta(n) + 0.36(-0.8)^{n-1}u(n-1)$. Analyze the frequency response of the filter to check the nature of the filter. Prove or disprove $h(n)$ is linear phase. [5]
- 6) The location of two zeros of a causal Type-I linear phase finite impulse response (FIR) filter is at $z = 0.5e^{j\frac{\pi}{3}}$ and $z = 1$. Construct the transfer function and impulse response of the filter for minimum order. [6]



National Institute of Technology Patna
Department of Electronics and Communication Engineering
Subject Code: EC45102 (Microprocessor and Microcontrollers)
MID-SEM EXAMINATION
DOE: 02/03/2023 (AN)

Semester: 4th

MM: 30

Course: B.Tech (ECE-I & ECE-II)

Time: 2 Hrs.

Note: Answer all questions

[5x6=30 Marks]

1. (a) What do you mean by pipelined architecture? How is it implemented in 8086? [CO-1, CO-2]
(b) Draw and discuss the internal block diagram of 8086. [CO-2] [2.5M+2.5 M]

2. (a) Write an assembly language program to move the contents of the memory location 0400H to register BX and to CX. Add immediate byte 03H to the data residing in a memory location, whose address is computed using DS=3000H and offset =0600H. Store the result of the addition in 0700H. Assume that the data is located in the segment specified by the data segment register DS which contains 4000H. [C0-3] [2.5 M]
(b) Define Microprocessor and differentiate between 8085 and 8086 Microprocessor. [CO-1] [2.5M]

3. (a) The contents of different registers are given below.
[ax]-1000h, [bx]-2000h, [si]-3000h, [di]-4000h, [bp]-5000h, [sp]-6000h, [cs]-0000h, [ds]-1000h
[ss]-2000h, [ip]-7000h
Offset (displacement)=5000h
Form effective addresses of the following addressing modes.
(i) Direct addressing modes
(ii) Register indirect
(iii) Register relative
(iv) Base index
(v) Relative base indexed

4. (a) Define PSW and discuss the conditional flag register of 8085 in brief. [C0-1] | 3M
(b) Show how the flag register is affected by the following instructions. [C0-3] | 2M

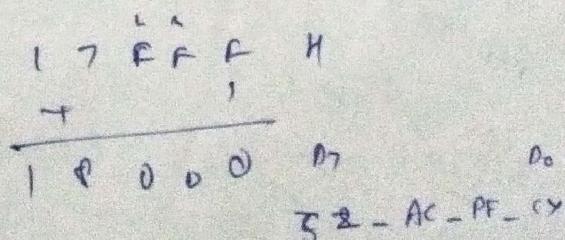
MOV A, #0F5H
ADD A, #0BH

5. Design memory interface circuitry for 8086 minimum configurations to interface 64KB of SRAM using 16Kx8 memory ICs. The address range of the memory device is 10000H to 1FFFFH.

6. Explain the function of the following signals of 8086

 - (a) TEST
 - (b) LOCK
 - (c) DT/R
 - (d) NMI
 - (e) BHE/S7

17 F



2nd Semester Examination, February 2023

B.Tech ECE Sec-2.

Electromagnetic Field Theory (EC-45101)

Time - 2 hrs

F.M. - 30

Answer all the questions

- Q1. Find the divergence of a vector and interpret it. (A)
- Q2. Discuss conductor properties and boundary conditions at the surface of conductor. (3.5)
- Q3. Obtain energy density in electrostatic field.
- Q4. Obtain the capacitance between two spheres whose separation d is very much larger than their radii. $\frac{1}{2} C E_0 = \frac{1}{2} \rho E$ (3.5) $\varphi = \int \rho dv = \int \rho r^2 dr = \frac{4}{3} \rho r^3 = C$ (4)
- Q5. Discuss magnetic vector potential $\vec{B} = \vec{E}_0$ (3.5)
- Q6. Find the magnetic field inside a conductor at a distance r from the centre of wire carrying a current I , also find total magnetic flux inside the conductor. $\frac{\mu_0 I}{2\pi r}$ (4)
- Q7. obtain two Maxwell's Equation for time varying field which deviate from steady state field.
- Q8. The electric vector \vec{E} of an electromagnetic wave in free space is given by $E_x = 0 = E_z$, $E_y = A G_s \omega \left(t - \frac{z}{c}\right)$ using Maxwell's Equation for free space, determine \vec{H} . (3.5)

$$D = \epsilon_0 E$$

$$x$$

$$E_t = 0$$



राष्ट्रीय प्रौद्योगिकी संस्थान पटना
National Institute of Technology Patna

राष्ट्रीय प्रायोगिका विद्यालय
Mid Semester Examination (Jan-Jun'23)
Department: Computer

Programme: B.Tech.-ECE
SC15101

Course Code: CS45101

Full Marks: 30

National Institute of Technology Patna
Session: 2022-23 Spring '23 Semester
I Engineering

Session: 2022-23 Spring 2023
and Engineering

Science and Engineering

Semester: 4th

Course: Object Oriented Programming

Duration: 2 hours

[Attempt all questions; Answer concisely only in blue/black ink; Use pencil for artwork;
Assume missing data; No mobile phones]

Assume missing data; No mobile phones]

[Marks, Course Outcome and Bloom's Level are mentioned on right-hand side of each question] CO

SI	Question body	
2.	सॉब-क्लास के एक कंस्ट्रक्टर में यदि एक स्पष्ट super() कॉल मौजूद है, तो यह कॉल कंस्ट्रक्टर में पहला स्टेटमेंट होना चाहिए।	(i) True. (ii) False.
d.	Given the following method mthd(int), what is the return value when mthd(2) is called?	<pre>private int mthd(int num){ if (num <= 1){ return 1; } else{ return 3 * mthd(num-1) + mthd(num-2); } }</pre>
	ऊपर दिया गया मेथड mthd(int) को देखते हुए, mthd(2) कॉल होने पर रिटर्न मान क्या होगा?	✓ 3 + 1 = 4
	(i) 43. (ii) 4. (iii) 13. (iv) Error.	
e.	What type of relationship exists between method func() in class A and method func() in class B?	<pre>class A{ private void func(){ System.out.println("Method from class A.");} } class B extends A{ public void func(String x){ System.out.println("Method from class B.");} }</pre>
	ऊपर दिया गया क्लास A में मेथड func() और क्लास B में मेथड func() के बीच किस तरह का संबंध मौजूद है?	
	(i) Method overriding. (ii) Method overloading. (iii) Both method overriding and method overloading. (iv) Neither method overriding nor method overloading.	
	[Course outcome(s) evaluated: CO-1(Remember/Recall)]	
3. a.	What is the output of the following program fragment?	(5)
	<pre>char x = 'A'; while(x != 'D') { switch(x) { case 'A': System.out.println(x); x = 'D'; case 'B': System.out.println(x); x = 'C'; break; ~ case 'C': System.out.println(x); x = 'D'; default: continue; ~ } }</pre>	
	ऊपर दिया गया प्रोग्राम खंड का आउटपुट क्या है?	
	[Course outcome(s) evaluated: CO-3(Understand/Explain)]	
b.	Given the for loop in the left table, a programmer has converted it into the while loop shown in the right table. Both the loops have syntax errors. But the converted while loop does not produce t	

SI	Question body	
3. b.	<p>same result as the for loop. State that error, and write the correct while loop.</p> <div style="border: 1px solid black; padding: 5px;"> <pre>int sum = 0; ① ② for(int i=1; i<4; i++){ if (i != 3) ③ sum += i; }</pre> </div>	(5)
	<pre>int i = 1; int sum = 0; while(i < 4){ if(i != 3){ sum += i; } i++; }</pre>	
4. a.	<p>Write a Java program to determine sum of two matrices. Your program must incorporate the following.</p> <ul style="list-style-type: none"> Create class 'Matrix', with a two-dimensional integer array as field, constructors, and 'input', 'display' methods. Include a static method within 'Matrix' class for addition, where two 'Matrix' objects are to be passed as arguments, and one 'Matrix' object is to be returned by that method as sum. Also include a demo class, containing main() method, in your program to input two matrices and display their sum. <p>दो मैट्रिसेस का योग निर्धारित करने के लिए एक Java प्रोग्राम लिखो। उस प्रोग्राम में निम्नलिखित शामिल होना चाहिए।</p> <ul style="list-style-type: none"> क्लास 'Matrix' बनाओ, जिसमें फ़ील्ड के रूप में एक two-dimensional पूर्णांक सरणी, और कंस्ट्रक्टर, मेथड 'input', मेथड 'display' होगा। योग के लिए क्लास 'Matrix' के भीतर एक static मेथड शामिल करो, जहाँ दो 'Matrix' ऑब्जेक्ट को argument के रूप में पारित करना है, और योग के परिणामस्वरूप एक 'Matrix' ऑब्जेक्ट को रिटर्न करना है। उस प्रोग्राम में दो मैट्रिसेस इनपुट करने और उनका योग प्रदर्शित करने के लिए एक डेमो क्लास भी शामिल करो, जिसमें main() मेथड रखना है। 	(5)
	[Course outcome(s) evaluated: CO-4(Apply/Solve)]	
b.	<p>Write a Java program to calculate area of a square using inheritance. Your program must incorporate the following.</p> <ul style="list-style-type: none"> Create class 'Shape', with 'name' as private field, public constructors, and public 'input', 'display' methods for 'name' field. Inherit from class 'Shape' another class 'Square' with fields 'side' and 'area', public constructors, public methods 'inputSide' and 'calArea'. Override method 'display' in class 'Square', in which also add a call to parent's 'display' method, to display 'name', 'side' and 'area' of 'Square' object. Also include a demo class, containing main() method, in your program to input side of a square and display its area. 	(5)
	[Course outcome(s) evaluated: CO-5(Apply/Use)]	

SI	Question body	CO / BL
4. b.	<p>Inheritance का उपयोग करके वर्ग के क्षेत्रफल निर्धारित करने के लिए एक Java प्रोग्राम लिखो। उस प्रोग्राम में निम्नलिखित शामिल होना चाहिए।</p> <ul style="list-style-type: none"> क्लास 'Shape' बनाओ, जिसमें private फ़ील्ड के रूप में 'name' और public कंस्ट्रक्टर्स होंगा, तथा 'name' फ़ील्ड के लिए दो मेथड 'input', 'display' होंगा। क्लास 'Shape' से एक और क्लास 'Square' इनहेरिट करों, जहां दो फ़ील्ड 'side', 'area' और public कंस्ट्रक्टर्स होंगा, तथा दो मेथड 'inputSide', 'calArea' होंगा। मेथड 'display' को क्लास 'Square' में ओवरराइड करों, जिसमें 'Square' ऑब्जेक्ट का 'name', 'side' और 'area' प्रदर्शित करने के लिए parent की 'display' मेथड का कॉल भी शामिल करों। उस प्रोग्राम में एक वर्ग के भुजा का माप इनपुट करने और उसके क्षेत्र प्रदर्शित करने के लिए एक डेमो क्लास भी शामिल करों, जिसमें main() मेथड रखना है। <p>[Course outcome(s) evaluated: CO-5(Apply/Use)]</p>	CO-5 Level-3

List of Course Outcomes of "Object Oriented Programming": After completing this course, a student should be able to —

CO-1. recall object oriented programming terminologies and principles, as well as fundamental concepts and programming practices based on Java programming platform; [Bloom level: Remember; Mapped to: PO-1]

CO-2. recognise programming structures for building exception handlers* in object oriented programming; [Bloom level: Remember; Mapped to: PO-1]

CO-3. explain concepts of inheritance, polymorphism, overloading, overriding in object oriented programming; [Bloom level: Understand; Mapped to: PO-1, PO-2]

CO-4. solve problems on selections, iterations and functions in Java language; [Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-5. use methodologies of object oriented programming in Java programs; [Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-6. implement Java programs in hands-on experiments to fulfil given problem objectives. [Bloom level: Apply; Mapped to: PO-3, PO-5]

X
GYB

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
Department of Electronics and Communication Engineering
MID SEMESTER EXAMINATION, Jan- June 2023

B. Tech: Semester-IV

Course Name: Pulse and Digital Switching Circuit

Maximum Time: 2 Hours

Course Code: EC45114

Max. Marks: 30

Instruction:

- Attempt all the questions.
- The Marks, CO (Course Outcome) and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

		Marks	CO	BL
1.	(a) Why Digital signal Processing (DSP) is preferred over Analog Signal Processing (ASP)? (b) How CMOS inverter is works as a switch? (c) What is an attenuator and also write their applications?	6	CO1+CO3	R, U, P
2.	(a) What are delay time and rise time in RC low pass circuit? Show the relationship between rise time and bandwidth. (b) Derive the expression of %Tilt of RC high-pass circuit? (c) Design a 3-input NAND gate using CMOS logic?	6	CO2+CO3	U, P, E
3.	(a) Derive the transfer function of the RC high-pass circuit and draw their transient response of voltage and current with a step input. (b) Explain how the Low-pass RC circuit works as an integrator? Also, draw the ideal and practical integrator using OP-AMP.	6	CO2	R, U, P, A, E
4.	(a) Explain the diode as a switch and draw their V-I and I-V characteristics? (b) A Ge diode having a leakage current of 35 nA at room temperature, let the forward voltage across the diode is 950 mV. Find its dynamic resistance?	6	CO1+CO2	U, P, A, E
5.	(a) Find the current (I) and voltage (V_o) of Fig. 1 shown below (Consider the diode is ideal). (b) Find the current (I_D) of Fig. 2 shown below (Consider the diode is practical and silicon-based).	6	CO3	U, A, E

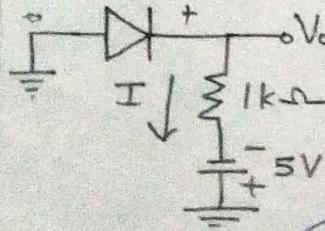


Fig. 1

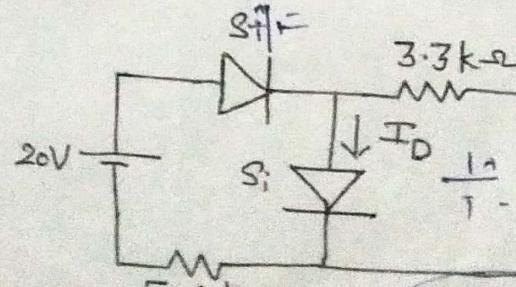


Fig. 2

(c) A 5V step is switched on to a 39 kΩ resistor in series with a 500 pF capacitor. Calculate the rise time of the capacitor voltage.

END

Attempt all questions.

- (1) Let a sequence $x(n) = \{0, 1, 2, 3\}$. Compute 4-point discrete Fourier transform (DFT) of $x(n)$. Using suitable property compute DFT of the sequence $y(n) = \cos(\frac{\pi}{2}n)x(n)$. [6]
- 2) Let a sequence $x(n) = n, 0 \leq n \leq 9$ and impulse response $h(n) = \{-1, 0, 1\}$. Dividing $x(n)$ into blocks of 4 samples, implement overlap-add method to compute $x(n) * h(n)$. [7]
- 3) Compute 4 point DFT of a sequence $x(n) = \{1, 3, 5, 7\}$ using decimation in frequency fast Fourier transform (DIF-FFT) algorithm and draw the Butterfly diagram. [6]
- 4) The location of two zeros of a causal Type-1 linear phase finite impulse response (FIR) filter is at $z_1 = 0.2 + 0.4j$ and $z_2 = e^{j\frac{\pi}{4}}$. Construct the transfer function and impulse response of the filter for minimum order of the filter. [6]
- 5) Design a linear phase finite impulse response (FIR) low pass filter (LPF) using Hamming window for the following specification. [6]

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} & 0 \leq |\omega| \leq \frac{\pi}{6} \\ 0 & \frac{\pi}{6} \leq |\omega| \leq \pi \end{cases}$$

- (6) Design a first order low-pass infinite impulse response (IIR) digital filter with 3-dB cut-off frequency $\frac{\pi}{6}$ by applying bilinear transform to the analog Butterworth filter. [8]
- (7) Design a Chebyshev analog filter with maximum pass-band attenuation of 2.5 dB at $\Omega_p = 20 \text{ rad/s}$ and minimum stop-band attenuation 30 dB at $\Omega_s = 50 \text{ rad/s}$. [7]
- 8) Obtain the direct form-II realization of the following transfer function. [6]

$$H(z) = \frac{1 + 0.5z^{-1} - 0.6z^{-2} + 0.7z^{-3}}{1 + 0.1z^{-1} + 0.2z^{-2} + 0.3z^{-3}}$$

- 9) Obtain the lattice-ladder structure for the following transfer function. [8]

$$H(z) = \frac{1 + z^{-1} + 2z^{-2} + 3z^{-3}}{1 + 0.2z^{-1} + 0.3z^{-2} + 0.4z^{-3}}$$



National Institute of Technology Patna
Department of Electronics and Communication Engineering
Subject Code: EC45102 (Microprocessor and Microcontrollers)
END-SEM EXAMINATION
DOE: 17/05/2023 (FN)

Semester: 4th

Course: B.Tech (ECE-I & ECE-II)

MM: 60

Time: 3 Hrs.

Note: Answer all questions.

- [10x6=60 Marks]
1. (a) Write 8086 an assembly language program to count the even and odd number. [CO-3] [2.5M]
(b) Indicate which mode and which timer are selected for each of the following. [CO-3] [2.5M]
(i) MOV TMOD, #12 H (ii) MOV TMOD, # 44 H
(c) Write an assembly language program for 8086 to reverse "COMPUTER". [CO-3] [2.5M]
(d) Illustrate an instruction sequence to read the content of external RAM locations 10F4H and 10F5H and place the values read in R6 and R7, respectively. [CO-3] [2.5M]
 2. (a) Define ARM and Explain the ARM core dataflow model with a neat diagram. [CO-1, CO-2] [5M]
(b) Interfacing ADC 0808 with 8086 using 8255 ports. Use port A of 8255 for transferring the digital data output of ADC to the CPU and port C for control signals. Assume that an analog input is present at I/P2 of the ADC and a clock input of suitable frequency is available for ADC. [CO-2, CO-4] [5M]
 3. (a) Enlist the salient feature of the 8051 family of microcontrollers. How does 8051 differentiate between external data memory and internal data memory? Also, discuss the functional description of the internal lower data memory of 8051. [CO-1, CO-4] [5M]
(b) Define USART as well as draw and discuss the internal architecture of 8251. [CO-2] [5M]
 4. (a) Compare polling and interrupt. What is the need of interrupts in microprocessor operations? Draw and discuss the internal architecture of 8259A. How will you provide more than eight interrupt lines to an 8086-based system? [CO-1, CO-2] [5M]
(b) List and explain the flags of the 8086 microprocessor with suitable examples. [CO-1] [5M]
 5. (a) Interface an 8255 with 8086 to work as an I/O port. Initialize port A as the output port, port B as the input port, and port C as the output port. Port A's address should be 0740H. Draw and Write a program to sense switch positions SW₀-SW₁ connected at Port B. The sensed pattern is to be displayed on port A, to which 8 LEDs are connected while the port C lower the display number of on switches out of the total eight switches. [CO-3, CO-4] [7M]
(b) Define BIU of 8086. And explain the concept of segmented memory. What are its advantages? [CO-1] [3M]
 6. (a) Design a 8086-based max mode system having 32Kb EPROM using 16KB chips and 128 KB RAM using 32KB chips. [CO-4] [7M]
(b) Write short notes on any two of the following:
(i) Bit and Byte-addressable register of 8051
(ii) RISC & CISC
(iii) TMOD



204090

[Attempt all questions; Answer concisely only in blue/black ink; Use pencil for artwork;
Assume missing data; No mobile phones]

[Marks, Course Outcome and Bloom's Level are mentioned on right-hand side of each question]

Sl.	Question body	CO	BL
1. a.	In the following program, explain the forms of polymorphism present in class B. (3) <pre>class A { int f(int x, int y) { return x+y; } int <u>f</u>(int x) { return x+10; } } //end of class A class B extends A { int <u>f</u>(int x) { return x-10; } } //end of class B</pre>	CO-3	Level-2
	ऊपर दिया गया प्रोग्राम में क्लास B में मौजूद पॉलीमॉरफिस्म के रूपों की व्याख्या करें। [Course outcome(s) evaluated: CO-3(Understand/Explain)]		
b.	List 3 differences between abstract class and interface. (3) एक्स्ट्रैक्ट क्लास और इंटरफेस के बीच 3 फर्क की तालिका बनाएं। [Course outcome(s) evaluated: CO-1(Remember/Recall)]	CO-1	Level-1
c.	Consider the following program. <pre>abstract class Bird { //blank body } class Chicken extends Bird { //blank body } public class Demo { public static void main(String args[]) { Chicken C = new Chicken(); System.out.println(C); } //end of main() } //end of class</pre>	CO-4	Level-3
	What will happen when the above program is compiled and executed? If there are compile-time and runtime errors, write solutions to debug them. If there are no errors, write down what will be displayed. (2) ऊपर दिया गया प्रोग्राम पर गौर करें। वह प्रोग्राम को कंपाइल और एक्जीक्यूट करने पर क्या होगा? यदि कंपाइल-टाइम और रनटाइम एरर हैं, तो उन्हें डीबग करने के लिए समाधान लिखें।		

Sl. Question body

1. c. यदि कोई एरर नहीं है, तो क्या प्रदर्शित होगा लिखें।
 [Course outcome(s) evaluated: CO-4(Apply/Solve)]

d. Consider the following program.

```
class Employee {
    protected String name;
    public Employee() { this.name = ""; }
    public Employee(String nm) {
        this.name = "Employee: " + nm;
    }
} //end of class
class Manager extends Employee {
    private String name;
    public Manager(String nm) {
        this.name = "Manager: " + nm;
    }
} //end of class
public class CastingDemo {
    public static void printName(Object ob) {
        String name = ob.getName();
        System.out.println(name);
    }
} //end of printName()
public static void main(String args[]) {
    Employee emp;
    Manager mgr;
    emp = new Manager("Abcd");
    printName(emp); → "Manager: Abcd"
    mgr = emp;
    printName(mgr);
} //end of main()
} //end of class
```

Find the compilation errors and debug them, if any.

ऊपर दिया गया प्रोग्राम पर गौर करें। वह प्रोग्राम का कंपाइलेशन एरर पता लगाएं, और यदि कोई हो तो उन्हें डीबग करें। (4)

[Course outcome(s) evaluated: CO-4(Apply/Solve)]

2. a. Consider the following program fragment.

```
public static void m(int x) throws Exception {
    if (x>=1)
        throw new IOException();
    else if (x<=0)
        throw new ArithmeticException();
} //end of m()
public static void mthd(int x) {
    try {

```

Question body

```
m(x);
} //end of 'try'
catch( ) {
    System.out.println(e);
}
catch(ArrayIndexOutOfBoundsException e) {
    System.out.println(e);
}
} //end of mthd()
```

Recognise the correct exception(s) supported by Java to write in the underline portion of catch block, so as to handle all types of exceptions thrown by public static void m(int), and give reasons for your answer.

ऊपर दिया गया प्रोग्राम खंड पर गौर करें। उस प्रोग्राम खंड में catch ब्लॉक के अंडरलाइन हिस्से पर लिखने के लिए Java द्वारा समर्थित एक्सेप्सनों को पहचानें। (2+2)

[Course outcome(s) evaluated: CO-2(Memory/Recognise), CO-3(Understand/Explain)]

b. Sometimes exceptions are caught not to handle them (i.e., neither any handling actions, nor displaying exception messages), but to report to external caller about any problem related to working principles. In this regard, consider the following program fragment.

```
public void doSomething() throws Exception {
    try {
        // statement(s) that might cause Exception
    } catch (Exception e) {
        // Note: no handling
    }
} //end of doSomething()
```

Recognise the programming structure for exceptions to write in the underline portion within catch block so as to report to external caller about any exception within try block. (3)

कभी-कभी एक्सेप्सनों को हैंडल करने के लिए नहीं कैच किया जाता है (यानी, न तो कोई हैंडलिंग करवाई, न ही एक्सेप्सन मैसेजेस दिखाना), लेकिन वर्किंग प्रिसेप्टों से संबंधित किसी भी समस्या के बारे में बाहरी कॉलर को रिपोर्ट करने के लिए एक्सेप्सनों को कैच किया जाता है। इस संबंध में ऊपर दिया गया प्रोग्राम खंड पर गौर करें। वह प्रोग्राम खंड में ट्राई ब्लॉक के भीतर किसी भी एक्सेप्सन के बारे में बाहरी कॉलर को रिपोर्ट हेतु catch ब्लॉक के अंडरलाइन हिस्से पर लिखने के लिए एक्सेप्सनों का प्रोग्रामिंग स्ट्रॉक्चर को पहचानें।

[Course outcome(s) evaluated: CO-2(Memory/Recognise)]

c. What is the output of the following program? (5)

```
class ExamDemoException {
    public static void main(String args[]) {
        Integer[] someInts = new Integer[100];
```

Sl.
2. c. Question body

```
int sum = 0;
try {
    for (Integer i : someInts) { (10)
        sum += i; sum+=i
    }
} catch (Exception e) {
    System.err.println(e);
}
System.out.println(sum);
System.out.println(someInts.length);
}//end of main()
}//end of class
```

ऊपर दिया गया प्रोग्राम का आउटपुट क्या है?

[Course outcome(s) evaluated: CO-4(Apply/Solve)]

3. a. Consider the following program for reading 'Input.txt' file through byte stream.

```
import java.io.*;
class ExamFileInputStreamDemo {
    public static void main(String args[])
        throws FileNotFoundException {
        try (FileInputStream f = new FileInputStream(
            "Input.txt")) {
            for (int i=0; i < 42; i++) {
                System.out.print((char) f.read());
            }
            for (int i=0; i < 10; i++) {
                f.read(); → byte
            }
            byte[] b = new byte[50];
            f.read(b);
            System.out.println(new String(b, 0, 50));
        } catch (RuntimeException e) {
            System.err.println(e.getMessage());
        }
    }
}
```

- There are four compile-time errors for the above program, which are present inside the main() method's body. Identify them. (4)
[Note: There is no 'File Not Found Exception'.]
- There is a single solution to be incorporated in the above program to debug all four compile-time errors. Write the solution. (2)

बाइट स्ट्रीम के माध्यम से 'Input.txt' फाइल पढ़ने के लिए ऊपर दिया गया प्रोग्राम पर गौर

Question body

करें।
i) वह प्रोग्राम में चार कंपाइल-टाइम एरर हैं, जो main() मेथड के बॉडी के अंदर मौजूद हैं।
उनकी पहचान करें।
[नोट: कोई 'फाइल नॉट फाउंड एक्सेप्शन' नहीं है।]

ii) सभी चार कंपाइल-टाइम एरर को डीबग करने के लिए उस प्रोग्राम में शामिल किया जाने वाला एक ही समाधान है। वह समाधान लिखें।
[Course outcome(s) evaluated: CO-4(Apply/Solve)]

b. What is the output of the following program, comprising of two Java files in same directory – Car.java and CarMemberInner.java? (6)

```
package Exam; //enclosing class
public class Car {
    private int yr;
    private class Tyre { //member inner class
        private String name;
        private double radius;
        public Tyre(String n, double r) {
            'this.name' = n; this.radius = r;
        }
        public String getName() { return this.name; }
        public double getRadius() { return this.radius; }
    }
    public Tyre T;
    public Car(int year, String Tyrenm, double TyreRad) {
        this.yr = year;
        this.T = new Tyre(Tyrenm, TyreRad);
    }
    public int getYr() { return this.yr; }
    public void disp() {
        System.out.println(this.toString());
    }
    public String toString() {
        String str = "Car make year: " + this.getYr() +
                    "\nCar tyre name: " +
                    this.T.getName() + "\nCar tyre
                    radius: " + this.T.getRadius();
        return str;
    }
}
```

```
//end of enclosing class
package Exam;
import Exam.Car;
public class CarMemberInner {
    public static void main(String args[]) {
        Car C = new Car(2019, "JK", 50.5);
        C.disp();
    }
}
```

COBL

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3. b. पिछले पेज में दिए गए प्रोग्राम, जिसमें दो Java फाइलें शामिल हैं — Car.java और CarMemberInner.java, जो एक ही डायरेक्टरी में रखा गया है, वह प्रोग्राम का आउटपुट क्या है?
 [Course outcome(s) evaluated: CO-3(Understand/Explain)]

4. Write a Java program to read two rational numbers from console and display result of their specified operation in corresponding irreducible rational number. Your program must incorporate the following. (12)
- Create classes 'Numerator' and 'Denominator', where in each class, incorporate integer 'val' as private field, public constructor(s), accessor and mutator methods for private field, and overriding 'public String toString()' method.
 - Create interface 'INumOp' to provide declarations of methods 'add', 'sub', 'mul', 'div' to perform basic arithmetic operations of given two rational numbers and method 'reduce' for reduction operation to simplify given rational number. For all methods, parameters and return types are Object classes. For e.g. 'Object add(Object a) throws Exception; ' is the declaration of 'add' method.
 - Create class 'RationalNum' by implementing 'INumOp', in which incorporate objects of 'Numerator' and 'Denominator' by composition (i.e., part-of relationship) as private fields, public constructor(s) declaring Exception to ensure non-zero 'Denominator', accessor and mutator methods for private fields, overriding 'toString()' method to account for sign of number, and implementing five methods of 'INumOp'.
 - Also include a demo class, containing main() method, in your program to input rational number(s) and choice of operation, and to display the result.
 - Note: a rational number is expressed as fraction " p/q " of two integers — numerator p and non-zero denominator q ; in the process of reducing a rational number, GCD (greatest common divisor) of given p and q divides both p and q to produce fraction of their respective quotients. The Euclidean algorithm for finding GCD is as follows.

```
function gcd(a,b)
  while b ≠ 0
    t ← b
    b ← Remainder from a ÷ b
    a ← t
  return a
```

Pattern NUM pattern

कंसोल से दो रैशनल नंबर (परिमेय संख्या) को पढ़ने के लिए और उन पर निर्दिष्ट आपरेशन के परिणाम एक इरेज्यूल रैशनल नंबर में प्रदर्शित करने के लिए एक Java प्रोग्राम लिखें। उस प्रोग्राम में निम्नलिखित शामिल होना चाहिए।

rationalnum port-of numerator , Denom,

Page 6 of 8

- Question body
- क्लास 'Numerator' और 'Denominator' बनाएं, जहां प्रत्येक क्लास में, private फ़ील्ड के रूप में इन्टिजर 'val', public कंस्ट्रक्टर्स, private फ़ील्ड के एक्सेसर और म्यूटेटर मेथड्स शामिल करें, और 'public String toString()' मेथड को ओवरराइड करें।
 - इंटरफ़ेस 'INumOp' बनाएं, जहां दो रैशनल नंबर पर मौलिक अरिथ्मेटिक ऑपरेशन्स के नंबर को सरल बनाने का रिडक्षन ऑपरेशन के लिए 'reduce' मेथड की डेकलैरेशन भी शामिल करें। सभी मेथड्स के लिए, पैरामीटर्स और रिटर्न प्रकारों Object क्लास हैं। उदा. 'Object add(Object a) throws Exception; ' एक डेकलैरेशन है।
 - 'INumOp' इम्प्लिमेंट करके क्लास 'RationalNum' बनाएं, जहां private फ़ील्ड के रूप में 'Numerator' और 'Denominator' की ऑब्जेक्ट्स को कॉम्पोजिशन (यानी, पार्ट-ऑफ रिलेशन) करके शामिल करें, तथा public कंस्ट्रक्टर्स शामिल करें जिसमें सके, private फ़ील्ड के एक्सेसर और म्यूटेटर मेथड्स शामिल करें, 'toString()' मेथड को नंबर का चिह्न के लिए ओवरराइड करें, और 'INumOp' के पाँच मेथड्स को भी इम्प्लिमेंट करें।
 - उस प्रोग्राम में दो रैशनल नंबर इनपुट करने, तथा ऑपरेशन को इनपुट करने, और उनका परिणाम प्रदर्शित करने के लिए एक डेमो क्लास भी शामिल करें, जिसमें main() मेथड रखना है।
 - नोट: रैशनल नंबर को दो इन्टिजरों के फ्रैक्शन "p/q" में बताया जाता है — न्यूमरेटर p और डीनोमिनेटर q। रैशनल नंबर को रिड्यूल करने के लिए p और q का GCD निकल कर p और q दोनों को विभाजित करके दोनों कोशंटों का फ्रैक्शन बनाने पे सरल रैशनल नंबर निकलता है। GCD निकलने के लिए यूक्लिडियन एल्गोरिदम पिछले पेज में दिए गए हैं।

- [Course outcome(s) evaluated: CO-5(Apply/Use)]
5. Write a Java program to construct a frame (of type java.awt.Frame), either by inheritance or by composition, with the following features. In the frame, there is a button (of type java.awt.Button) labelled "Click Me", and there is a text-label (of type java.awt.Label) with initially empty label. When the button is clicked, then the label of text-label is changed to "I'm here", and remains unchanged for every click after that. Additional information about the APIs of AWT are as follows.

- Selective APIs from java.awt.Frame: public Frame(String title), public Component add(Component comp), public String getTitle(), public void setLayout/LayoutManager mgr), public void setLocation(int x, int y), public void setTitle(String title), public void setSize(int width, int height), public void setVisible(boolean b).
- In setLayout(LayoutManager mgr), pass "new FlowLayout()" as argument.
- Selective APIs from java.awt.Button: public Button(String

Level 3
CO 5

Level 3
CO 5

Sl.	Question body	CO-5 Level 3
5.	<p>label), public void addActionListener(ActionListener L), public String getLabel(), public void setLabel(String label), public void setVisible(boolean b).</p> <ul style="list-style-type: none"> ▪ Selective APIs from java.awt.Label: public Label(), public Label(String text), public String getText(), public void setLocation(int x, int y), public void setSize(int width, int height), public void setText(String text), public void setVisible(boolean b). <p>एक फ्रेम (java.awt.Frame के टाइप) को बनाने के लिए एक Java प्रोग्राम लिखें, जहां फ्रेम-निर्माण या तो इन्हेरिटेस या कॉम्पोजिशन द्वारा हों, और निम्नलिखित विशेषताएँ हों। वह फ्रेम में एक बटन (java.awt.Button के टाइप) होगा, जिस पर "Click Me" का लेबल लगा होगा, और एक टेक्स्ट-लेबल (java.awt.Label के टाइप) होगा, जिस पर शुरू में खाली लेबल रहेगा। बटन पर क्लिक करने पे टेक्स्ट-लेबल का लेबल "I'm here" में बदल जायेगा, और उसके बाद प्रत्येक क्लिक के लिए लेबल नहीं बदलेगा। AWT का API के बारे में अतिरिक्त जानकारी ऊपर दिया गया है।</p> <ul style="list-style-type: none"> ▪ चुनिंदा API java.awt.Frame से: पिछले पेज में दिए गए हैं। ▪ setLayout(LayoutManager mgr) में आर्गुमेंट के रूप में "new FlowLayout()" पास करें। ▪ चुनिंदा API java.awt.Button से: पिछले पेज में दिए गए हैं। ▪ चुनिंदा API java.awt.Label से: ऊपर दिए गए हैं। <p>[Course outcome(s) evaluated: CO-5(Apply/Use)]</p>	

List of Course Outcomes of "Object Oriented Programming": After completing this course, a student should be able to —

CO-1. recall object oriented programming terminologies and principles, as well as fundamental concepts and programming practices based on Java programming platform; [Bloom level: Remember; Mapped to: PO-1]

CO-2. recognise programming structures for building exception handlers in object oriented programming; [Bloom level: Remember; Mapped to: PO-1]

CO-3. explain concepts of inheritance, polymorphism, overloading, overriding in object oriented programming; [Bloom level: Understand; Mapped to: PO-1, PO-2]

CO-4. solve problems on selections, iterations and functions in Java language; [Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-5. use methodologies of object oriented programming in Java programs; [Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-6. implement Java programs in hands-on experiments to fulfil given problem objectives. [Bloom level: Apply; Mapped to: PO-3, PO-5]

----- X -----

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NATIONAL INSTITUTE OF TECHNOLOGY PATNA
Department of Electronics and Communication Engineering
END SEMESTER EXAMINATION, May 2023

B. Tech: Semester-IV

Course Name: Pulse and Digital Switching Circuit
Maximum Time: 3 Hours

Course Code: EC45114
Max. Marks: 60

Instruction:

- Attempt all the questions.
- The Marks, CO (Course Outcome), and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

		Marks	CO	BL
1.	(a) Explain how the diode is used as a switch and draw their V-I and I-V characteristics? (b) What is a clamper circuit, explain the diode-based negative clamper circuit with a suitable example. (c) What is a comparator, explain the diode comparator and write their applications.	12	CO1+CO3	R, U, P
2.	(a) Explain how the Low-pass RC circuit works as an integrator? Also, draw the ideal and practical integrator using OP-AMP. (b) A Si diode having a leakage current of 20nA at room temperature, let the forward voltage drop across the diode is 650mV . Find its dynamic resistance? (c) Design a 3-input NOR gate using CMOS logic?	12	CO2	U, P, E
3.	(a) Derive the transfer function of the RC high-pass circuit and Derive the expression of %Tilt of the RC high-pass circuit? (b) What is the clipping circuit, explain the series and shunt clipper circuit with suitable examples.	12	CO1	R, U, A, E
4.	(a) Explain the working of a monostable multivibrator using 555 timer IC and calculate the time period (T). Also, write the applications of the monostable multivibrator. (b) Explain the working of an astable multivibrator using an operational amplifier and also derive the expression of the time period (T).	12	CO1+CO2	U, P, A, E
5.	(a) Explain the basic principle and working of the miller and bootstrap time base generator. (b) Design the Schmitt trigger circuit using an operational amplifier and bipolar transistors and explain the working of the operational amplifier-based Schmitt trigger, and also draw the hysteresis curve?	12	* CO1+CO2+CO3	U, P, A, E

END



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NATIONAL INSTITUTE OF TECHNOLOGY PATNA
Department of Electronics and Communication Engineering
END SEMESTER EXAMINATION, Jan-June 2023

B. Tech: Semester-IV (Section-2)

Course Name: Electromagnetic Field Theory

Maximum Time: 3 hours

Course Code: EC 45101

Max. Marks: 60

Instruction:

- Attempt all questions.
- The Marks, CO (Course Outcome) and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

		Marks	CO	BL
Q 1.	Find the reflection coefficient for perfect insulator oblique incidence in the case of parallel polarization also discuss Brewster angle?	10	CO1+ CO2	R, U, P
Q 2.	(a) Find power loss in a plane conductor? [6 Marks] (b) A short vertical transmitting antenna erected on the surface of a perfectly conducting earth produces effective field strength $E_{eff} = E_0 \sin\theta \text{ mv/m}$ At point a distance 1 mile from the antenna Compute the pointing vector and total power radiated ($H = H_0 \frac{E_\theta}{\eta_0}$). [4 Marks]	10	CO2+ CO3	U, P, E 1/3
Q 3.	Find the resistance and reactance of a transmission line for complex impedance termination?	10	CO3+CO4	R, U, P, A, E
Q 4.	(a) Find the quality factor Q of a resonant transmission line section? [7 Marks] (b) For low loss transmission line section which are much shorter than one quarter wavelength find out the <u>input reactance</u> when the line is shorted and when the line is open? [3 Marks]	10	CO2+ CO4	U, P, A, E
Q 5.	In a media characterized by $\sigma=0, \mu=\mu_0, \epsilon=4\epsilon_0$ and $\vec{E}=20\sin(10^8 t - \beta z)\hat{y}$ V/m calculate β and \vec{H} ?	10	CO4+ CO5	U, P, A, E
Q 6.	The electric field strength of a uniform plane electromagnetic wave in free space is 1 V/M and frequency is 500 MHz If a very large thick flat copper plate is placed normal to the direction of wave propagation. Determine (a) \vec{E} & \vec{H} at the surface of the plate (b) Depth of penetration (c) Conduction current density at the surface $\rightarrow \frac{J_0}{\eta}$ (d) Conduction current density at distance 0.01mm below the surface $\leftarrow J_0 e^{-\frac{z}{l}}$ (e) Linear current density $\frac{J_0}{l}$ (f) The surface impedance γ (g) Power loss per meter square of the surface area. , $\epsilon=\epsilon_0$ & $\mu=\mu_0$,	140	CO3+CO5	R, U, P, A, E

END