

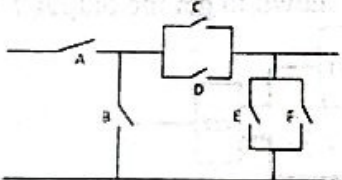

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
Department of Electronics and Communication Engineering
MID-SEMESTER EXAMINATION
Session Jul-Dec 2024

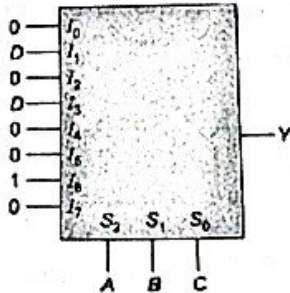
B.Tech.: Semester-I
Course Name: Digital Design
Maximum Time: 2 hours

Course Code: EC14102
Max. Marks: 30

Instruction:

1. Attempt all questions.
2. Assume any suitable data, if necessary.
3. 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.	<p>Answer all the questions (each 1 Marks)</p> <p>a) In a 4-variable Karnaugh map, a 3-variable POS term is produced by _____ cell group of 0's.</p> <p>b) Prove that $(\overline{AB} + \overline{A} + AB) = 0$.</p> <p>c) Convert the following numbers with the indicated bases to decimal: (i) $(4310)_6$ (ii) $(198)_{12}$</p> <p>d) How many two inputs NOR gates will be used to implement two inputs NAND and XNOR gates?</p> <p>e) Implement the following Boolean function with the minimum number of two inputs NAND Gate: $f(W, X, Y, Z) = (\overline{W} + \overline{X}) \cdot (\overline{Y} + \overline{Z})$</p> <p>f) Convert $(42)_8$ in Gray code and find the BCD code for a decimal number $(478)_{10}$.</p> <p>g) Find the logic expression of Y for the following switching circuit.</p>  <p>h) The waveforms in below figure are applied to points A and B of a 2-input AND gate followed by an inverter. Draw the output waveform.</p>  <p>i) Calculate all the minterms present in canonical SOP expression $\overline{A} + B\overline{C}$.</p> <p>j) Perform the 1's and 2's complement of following numbers: (i) $(101100)_2$ (ii) $(0.0110)_2$</p>	10	CO1, CO2	U, A, R, E,
2.	<p>A Boolean function of three variables A, B, and C is defined as follows: $f(0,0,1)=f(0,1,1)=f(1,1,0)=f(1,1,1)=1$; $f(0,0,0)=f(0,1,0)=f(1,0,0)=f(1,0,1)=0$; Assuming complements of A, B, and C are not available. Construct the truth table and draw the logic diagram of the minimized Boolean expression. What will be the total minimum cost for realizing f using only 2-input NOR gates, 2-input AND gates, and 2-input OR gates (each having unit cost).</p>	5	CO1	U, R

3.	Design a sequence generator for a sequence 110101. Or Design a counter for the following sequence generator $0 \rightarrow 12 \rightarrow 10 \rightarrow 6 \rightarrow 9 \rightarrow 2 \rightarrow 7 \rightarrow 14 \rightarrow 5 \rightarrow 8 \rightarrow 0$	
4.	Design the logic circuit to perform the following operation. (a) $A + B$ (b) $B - A$ Or Design a sequential circuit for a MOD-10 synchronous counter. Perform the operation using state table. Draw the state diagram perform the operation using T-flip-flop.	5
5.	What is priority encoder? Design the 8×4 priority encoder with a valid output. Or Explain 8×1 multiplexer with the logic diagram and truth table. What is the logic function of output Y for the following 8×1 multiplexer? 	5
6.	What, in general terms, is the distinction between computer organization and computer architecture? List and briefly define the main structural components of a computer. Or Design a MOD-12 ripple-down counter and show the timing waveform with output at each clock pulse. If the input clock frequency is 600 kHz then find the frequency of the output waveform. Assume all flip flops are negative edge triggered with 0 output initially.	5
7.	What is the difference between DRAM and SRAM in terms of applications and characteristics such as speed, size, and cost? OR What do you mean by the overriding input signals? What are their types? Explain the working and operation of Johnson counter. What are the differences between the ring and Johnson counter?	5
8.	What are the differences among direct mapping, associative mapping, and set-associative mapping? Or Explain the operation of the SR flip-flop with logic diagram, truth table, characteristic table, excitation table, and state diagram.	5



NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
MID-SEMESTER EXAMINATION, JUL - DEC 2024

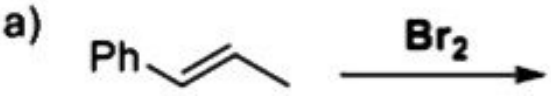
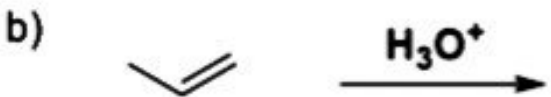


Program: B.Tech; Semester: 1st
Course Code: CH14101
Full Marks: 30

Batch: CSE – II

Department: CSE
Course Name: Engineering Chemistry
Duration of Examination: 2 hours

All questions are compulsory

Q1	Define proximate analysis of coal. A sample of coal was analyzed as follows: Exactly 2.5g was weighed into a silica crucible. After heating for one hour at 110°C, residue weighed 2.415g. The crucible next was covered with a vented lid and strongly heated for exactly seven minutes at 950°C. The residue weighed 1.528g. The crucible was then heated without the cover until a constant weight was obtained. The last residue was found to weigh 0.245g. Calculate the percentage results of the above analysis.	03	CO1
Q2	The percentage composition of a sample of bituminous coal was found to be as under: C - 70%, H – 10%, O – 10%, N – 2%, S – 1% & Ash = rest. Calculate the minimum weight of air necessary for complete combustion of 1 kg of coal and the percentage composition of the dry products of combustion by weight.	03	CO1
Q3	<p>a) Explain with mechanism the increasing percentage of the Hofmann eliminated product along the series</p> <div style="text-align: center;"> <p>Base = $\text{CH}_3\text{CH}_2\text{O}^-$ (30%) $(\text{CH}_3)_2\text{CHO}^-$ (72%) $(\text{CH}_3)_3\text{CO}^-$ (77%) $\text{CH}_3\text{CH}_2\text{CH}_2\text{O}^-$ (78%)</p> </div> <p>b) Predict the compound(s) which will undergo elimination reaction. Show the eliminated product along with mechanistic justification.</p> <div style="text-align: center;"> <p>i) </p> <p>ii) </p> <p>iii) </p> </div>	04	CO4
Q4	Describe ultimate analysis of coal with percentage calculation. Highlight the significance of ultimate analysis of coal.	05	CO1
Q5	Write the difference between nucleophilicity and basicity. Why iodide is more nucleophilic than fluoride? Provide two reasons.	05	CO4

Q6	What are the reagents for nitration of aromatic compound? Show the mechanism for effective electrophile generation and nitration reaction. Describe the energy profile for nitration reaction.	05	CO4
Q7	<p>Predict the product formation with mechanism for the following: -</p> <p>a)  <chem>CC=Cc1ccccc1.BrBr>></chem></p> <p>b)  <chem>CC=C.O[+]>></chem></p> <p>c)  <chem>CC=C.Br>></chem></p> <p>d)  <chem>CC=C.BB>></chem></p>	05	CO4



NATIONAL INSTITUTE OF TECHNOLOGY PATNA
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MID SEMESTER EXAMINATION, SEPTEMBER 2024

BTech: 1st Semester (CSE) (Section I, II, and III)
Course Name: Information Technology Workshop
Maximum Time: 2 hours

Course Code: CS14106
Maximum Marks: 30

Instructions:

Question 1 & 2 are compulsory for all the sections of CSE

Question 3 is compulsory for Section I and III only whereas Q4 is compulsory for Section II only

Sub-questions must be answered sequentially in one place

The marks, Course Outcome (CO) related to questions are mentioned on the right-hand side margin

Q.No.	Question	Marks	CO
1 a)	What fundamental set of programs control the internal operations of the computer's hardware? Give the name and explain in brief with suitable examples.	[3+3+4]	CO1
b)	What do you call a program that performs a specialized task, such as a virus scanner, a file compression program, or a data backup program? Give the name and explain in brief with suitable examples.		
c)	Word processing programs, spreadsheet programs, email programs, web browsers, and game programs belong to what category of software? Give the name and explain in brief with suitable examples.		
2 a)	The memory is characterized based on which key factors? Name them and explain in brief.	[2+2+3+3]	CO2
b)	The two broad categories of memory used in the computer. What are they? Explain each of them in brief with suitable examples.		
c)	A program has to be copied into what type of memory each time the CPU executes it? Give the name and explain in brief with suitable examples.		
d)	When a CPU executes the instructions in a program, it is engaged in what process? Explain in brief.		
3 a)	Evaluate the differences between the third and fourth generations of computers. How did advancements in microprocessor technology change the landscape of computing?	[3+4+3]	CO1
b)	Explain in brief the role of linkers and loaders in modern software development. How do they help make applications run better, and what challenges do developers face with dependencies and loading times?		
c)	Why is secondary memory slower than primary memory? How does the operating system manage the interaction between primary and secondary memory?		
4 a)	Convert the binary number $(10101010111)_2$ to octal, decimal, and hexadecimal formats.	[3+2+2+3]	CO4
b)	What is used for the fabrication of optical fibres that are used for communication?		
c)	What is core in the optical fibre?		
d)	What are the different ways of transmitting data. Explain each of them in brief with suitable example.		

Wish you all the best

National Institute of Technology Patna
Department of Computer Science and Engineering
Mid Sem Examination – August – December 2024

Course Name: Programming in C

Course Code: CS14102 / CS17101

Time Allowed: 2 Hours

Total Marks: 30

Department: CSE / Mathematics and Computing

Semester: 1st

Instructions:

This Question Paper contains two sections. CSE3 & Mathematics and Computing should attempt Section I only.

CSE1 and CSE2 students should attempt section II only

Assume missing data if any.

Section I

(For CSE3 & Mathematics and Computing Students only)

Q1. [3+2+5=10 Points][CO1,3,4][BL3]

- a. Write a C program that utilizes a two-dimensional array. The program should prompt the user to input p number of rows, with each row containing q elements. After receiving the input, the program should display the elements in the output.
- b. Write the C program to swap number using the third variable.
- c. Write a C program that accepts three integers from the user and determines which of these integers is the largest. The program should implement input validation to ensure that only valid integer values are accepted. Draw The flow chart for the same.

Q2. [5+5=10 Points][CO3][BL2]

- a. How switch statement can be effectively used to represent and handle different months of the years by assigning unique integer value to each month. Write the C program for the same.
- b. Write any program using **break** and **continue** statement? Explain when you will use break and continue statements according to your program.

Q3. [5 Points][CO3][BL3] Suppose in your college institute library charges the fine for every book returned late. For the first five days the fine is one rupee, for 6 to 10 days fine is two rupees and above 10 days fine is 10 rupees. Suppose if you return book after 30 days your membership will be cancelled. Write a C program to accept the number of days the member is late to return the book and display the fine or the appropriate message.

Q4. [1x5=5 Points][CO2,3][BL3] Will the following code snippet compile, if so, what will be output. Explain your answer in all cases:

a. `main()`
`{ int a=100, b, c;`
`if(a>=200)`
`b=30;`
`c=20;`
`printf("%d %d",b,c); }`

c. `main()`
`{ int x=10; float y=10.0;`
`if(x==y)`
`printf("x and y are equal ");`
`else`
`printf("x and y are not equal"); }`

e. `main()`
`{ int i=4,j=-1,k=0,w,x,y,z;`
`w=i || j || k`
`x= i && j && k`
`y= i && j || k`
`z= i || j && k`
`printf("w=%d, x=%d, y=%d, z=%d" ,w,x,y,z); }`

b. `main()`
`{ int a=10, b=20;`
`if(a==b)`
`printf("%d %d",a,b);`
`}`

d. `main()`
`{ int x=66;`
`char y='B';`
`if(x==y)`
`printf(" x is equal to y");`
`else`
`printf(" x is not equal to y); }`

... as the
... which
... if 1 is
... position
... should

a) Write a C program to input two unsigned integer numbers. Assume first number as the value on which operation has to be done (say operand). Assume second value as position on which operation will be done(say n). Further program should flip the bit (if it is 0, it should become 1 and if 1 it should become 0) present on the nth position and print the final output. For ex: if operand is 10 and position is 2. Then (10)_b = 00000000000000000000000001010. On flipping the bit position 2 (counting should start from 0), it will become 00000000000000000000000001110 = 14.

b) Assume you input your roll number to the program and unit digit of your roll number as position value. What will the above program print. For example, if your roll number is 2406189, then first input will be your roll number 2406189 and second input will be the unit digit in your roll number i.e. 9.

Q3. [5 Points][CO1,2][BL3] Write two C programs to take two numbers as input and swap their values. First program should swap the values using a third variables, however second program should do so without any third variable.

- Explain the reason behind having multiple options like int, short, long etc. to store integer data types.
- Differentiate between signed and unsigned integer.

```
a)
int main(){
int a=10,b=20;
return 0;
}
```

```
b)
int main(){
int a=10,b=20;
printf("%d,%d",a,b);
return 0;
}
```

```
c)
int main(){
int a=10,b=20;
printf("%d,%d",a,b);
return 0;
}
```

```
a)
int a = 10; int b = 40;
a<<b;
printf("%d and %d after %d << %d operation is
%d and %d",a,b,a,b,a,b);
```

```
b)
int a = 40;
int b = 4;
printf("Output of %d << %d operations is %d",a,b,a<<b);
```

National Institute of Technology Patna
Department of Mathematics
Mid Semester Examination : September-October, 2024

Course Name: Engineering Mathematics – II
Program: B.Tech.(CSE-II)
Duration: 2 Hrs

Course Code: MA14102

Full Marks: 30

Answer All The Questions

1. Find the inverse of the following matrix using Row reduction Method:

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}. \quad [4M]$$

2. For all values of c , find the row reduced echelon form of the following matrix

$$A = \begin{bmatrix} 1 & 1 & 2 & 2 \\ 2 & 2 & 4 & 4 \\ 1 & c & 2 & 2 \end{bmatrix}. \text{ Hence find the all possible solutions of } Ax = 0. \quad [6M]$$

3. Let V and W be the two vector spaces over the field \mathbb{F} and $T : V \rightarrow W$ be a linear mapping. Show that T is one-to-one if and only if $N(T) = \theta_v$. [5M]

4. If $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$, be a linear mapping, defined by

$$T(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t).$$

Find the matrix representation of T with respect to the standard bases of \mathbb{R}^4 and \mathbb{R}^3 . Hence, find the dimension of the image of T and the kernel of T . [6M]

5. Does the set $\{1 - 2x - 2x^2, -2 + 3x - x^2, 1 - x - 6x^2\}$ is a basis for $P_2(\mathbb{R})$? Explain. Here $P_2(\mathbb{R})$ denotes the space of all second order polynomials over \mathbb{R} . [5M]

6. Define the algebraic and geometric multiplicities of an eigenvalue of a square matrix. Hence find the eigenvalues and eigenvectors of the following matrix.

$$B = \begin{pmatrix} 4 & 0 & 1 \\ 2 & 3 & 2 \\ 1 & 0 & 4 \end{pmatrix}. \text{ Also, find the algebraic and geometric multiplicities of the eigenvalues.} \quad [4M]$$

*****ALL THE BEST*****