



- (a) You are given two floating points number A and B. Give a strategy for performing the ADDITION operation on the two numbers for the following two case. No need to write any program. [2+2=4]
- Case-I: The two numbers have same exponent (e) and sign (s) but different mantissa (m)
- Case-II: The two numbers have different exponents (e) signs (s) mantissa (m)
- (b) Numerologists map large numbers to a single digit number between 1 to 9 in order to tell future. For example, given a number 8734, they reduce it as follows $8+7+3+4 = 22$, $2+2 = 4$, so the number 8734 reduces to 4. Write a program in C program, which takes a number as input and reduces it to a single digit number between 1 to 9. (Note that only the number 0 can reduce to 0 and we assume that the input will always be non-zero.) [4]
- (c) The character arrays[] are used to store strings or sequence of characters which ends with \0 and we know that array name itself is a pointer. Is there any difference between these two declaration `char amessage[] = "now is the exam"` and `char * pmessage = "now is the exam"`? If "yes" what are those differences? [2]
- (d) What will be the output of the following programs? [2 + 2 = 4]

```
#include <stdio.h>
int main()
{
    int arr[3] = {2, 3, 4};
    char *p;
    p = arr;
    (i) p = (char *) ((int *) (p));
    printf("%d", *p);
    p = (int *) (p+1);
    printf("%d", *p);
    return 0;
}
```

```
#include <stdio.h>
int main()
{
    int a=5;
    int x;
    (ii) x = ~a + a & a + a << a;
    printf("%d", x);
    getch();
    return 0;
}
```

- (e) Which of the following three functions are not likely to cause problems with the pointer? Justify your answer. [4]

```
(i) int* jgec(void)
{
    int x = 10;
    return(&x);
}
```

```
(ii) int* jgec(void)
{
    int* ptr;
    *ptr = 10;
    return ptr;
}
```

```
(iii) int* jgec(void)
{
    int* ptr;
    ptr = (int*) malloc(sizeof(int));
    *ptr = 10;
    return ptr;
}
```

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH./CSE /PCC-CS302/2022

SECOND CLASS TEST
DATA STRUCTURE & ALGORITHMS

Full Marks: 15

Time: 45 Minutes

[LONG ANSWER TYPE QUESTIONS]

Answer any *three* questions

3x5=15

1. Write your full name (first name and last name without space) in capital letters.
Create the AVL tree of your full name.
2. Construct a binary tree from the following preorder and inorder traversal:
Pre-order: 1,2,4,8,9,10,11,5,3,6,7
In-order: 8,4,10,9,11,2,5,1,6,3,7
3. Derive the average case time complexity of Quick sort algorithm.
4. Write the merge sort algorithm.
5. Create the Max heap for the following data:
50,30,20,15,10,8,16,60 (Show the stepwise logical diagram)

5

5

5

5

5

Computer Organization (PCC-CS302)

Date of Examination: 13.12.22 (Internal Exam-2) CSE Dept.

Time: 45 Minutes

Full Marks: 15

Attempt any three. (Each question carries 5 marks)

1. Consider a memory system that uses 32 bit address to address at the byte level, plus 128KB cache that uses a 128 Byte line size.
 - a) Assume an associative cache. Find the size of tag, number of blocks in main memory, number of lines in cache.
 - b) Assume a direct map cache. Determine the parameters tag, line(block) number, byte offset.
2. Suppose a memory addressing mechanism having 6 bit in MAR and each address is used to refer to only a single bit among 64 bit of data. You are given 3-to- 2^3 decoders as many as required to design the system. Draw the diagram for the above system.
3. Draw the block diagram of a single BCD adder and explain the working mechanism.
4. A two-way set associative cache has lines of 32 bytes and a total size of 64K Bytes. The 64M Bytes main memory is byte-addressable. Show the format of main memory address.

1. For a given 32 bit unsigned integer check if it is valid or not according to the definition given below. **Valid:** the binary representation of the number should only have sequences of **00**, **01**, and **10**. **Invalid:** If there is any occurrence of **11** in its binary representation. **Input format:** First line contains a single 32 bit unsigned integer. **Output format:** Print 1 if input is valid, Print -1 if input is invalid. [5]
2. Suppose you are in-charge of vaccine administration during the Covid pandemic and you want to gather enough vaccines to cater to everyone. The number of vaccines required on the n th day is the sum of the vaccines required in the previous three days. **Therefore**, if $v(n)$ is the number of vaccines required on n th day, **then:** $v(n) = v(n-1) + v(n-2) + v(n-3)$. Assume $v(0) = v(1) = 0$ and $v(2) = 1$. Write a **user-friendly C** program using loops (non-recursive) that will take an input n and find the vaccines required on the n th day. **Constraints:** Assume n to be a natural number and $2 < n \leq 50$ Note that $v(50) = 3122171529233$. Please remember to use suitable data types to hold such large values.? [5]
3. Is it possible to determine the byte-size of a structure in C without using the inbuilt `sizeof()` function? If so, write a sample C code snippet to demonstrate your strategy. [2]
4. What will be the output of the following pieces of code? Justify your answer. [1+1+1=3]

a

```
int main()
{
char *str = "Hello world";
printf("%d", printf("%s", str));
return 0;
}
```

b

```
int main()
{
int i=0;
for (; i <= 2;) printf(" %d" , ++i);
return 0;
}
```

c

```
int fact(int i)
{
int res;
if (i==1) return(1);
res = fact(i-1)*i;
return(res);
}
```

JGEC/CSE/ESC301/2022/Class Test-I
DIGITAL ELECTRONICS

Times: 45 min

Full Marks: 15

Answer any three

- | | | |
|----|--|---|
| 1. | i) Write two applications of multiplexer. | 1 |
| | ii) Implement the following function with an 8 to 1 multiplexer. ($A=S_2, B=S_1, D=S_0$)
$F(A, B, C, D) = \sum(0, 2, 4, 6, 7, 8, 9, 10, 12, 13, 15)$ | 4 |
| 2. | i) Simplify the following functions together with don't care condition d, express the simplified function in the SOP: (i) $F(A, B, C, D) = \sum(0, 6, 8, 13, 14)$, $d(A, B, C, D) = \sum(2, 4, 10)$ | 3 |
| | ii) State the DeMorgan's Laws with example. | 2 |
| 3. | i) Why is the NAND (or NOR) gate called digital building block? | 1 |
| | ii) Design a combinational circuit that accepts a three-bit number (X) and generates an output binary number (Y) where $Y = X^2 + 1$. Assume, Y is a binary number of 6 bits. | 4 |
| 4. | i) A combinational circuit is defined by the following three functions:
$F1 = x'y + xyz'$; $F2 = x + yz'$; $F3 = xy + x'y'$. Design the circuit with a decoder and external gates. | 3 |
| | ii) Implement a full adder using multiplexer. | 2 |

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
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CSE /PCC-CS302/ CLASS TEST-I/2022

DATA STRUCTURE & ALGORITHMS

Full Marks: 15

Time: 45 Minutes

[LONG ANSWER TYPE QUESTIONS]

Answer any *three* questions

3x5=15

1.
 - i) Write down an efficient searching algorithm from an array of n integers and derive and analysis its time complexity.
 - ii) Define ADT with suitable example.
2.
 - i) Consider the following array in C language (Turbo C compiler):

`float a[10][5];`

Find out the address of the *`a[6][3]`* where the base address of the array **a** is 1000.
 - ii) Derive the average case time complexity of linear search algorithm.
3.
 - i) If $f(n) = 3n^4 + 6n^2 + 13$, then prove that $f(n)$ is not $O(n^3)$
 - ii) Define five asymptotic notations, Big O, Big Omega, Theta, small o and small omega with geometrical interpretation and suitable examples.
4.
 - i) Define the limitations of binary search algorithm.
 - ii) Is it possible to apply the binary search algorithm to sorted link list? Justify your answer.
 - iii) Prove that all *log* functions grows in the same fashion in terms of Big O notation.
5.
 - i) Write down an efficient procedure/algorithm to delete the middle element from a linked list?
 - ii) Which searching algorithm will you prefer among linear search and binary search? Explain your answer.

JGEC/B.TECH/ CSE/Class Test II/HSMC-301/ 2022-23
ECONOMICS FOR ENGINEERS

Full Marks: 15

TIME-45MINS

- 1) *What is engineering economics? State the role of engineers in economic decision making process. Write down the steps involved in economic decision making process.* (3+6+6)