

**Question cum Answer Booklet**

Indian Institute of Technology Kharagpur  
Department of Computer Science & Engineering  
**Programming & Data Structures 10001**  
Autumn Semester 2009

Thu, 20 August 2009 (Eve.)

Class Test I

**Max. Time: 60 min**

**Max. Marks: 50**

**Advice:**

- I. There are 5 printed pages and 13 questions.
- II. Carry out all the jobs listed below in the space provided. No separate sheets shall be provided.
- III. Include proper explanations wherever asked. A correct output without explanations/reasons will fetch a duck.
- IV. Use the blank pages for your rough work.

**Name:**

**Roll Number:**

**Section:**

1. Fill in the blanks (for appropriate actions mentioned in brackets): [5]

```
_____ # include <stdio.h> _____  
/* Include a header file for I/O operation. (1) */  
  
main()  
{  
    float x,y;  
    int z;  
  
    printf("Read x and y \n");  
    scanf("_____%f%f____", __&x, __ &y); /* Read x and y in appropriate format. (1) */  
    z= _____(int)____(x+y); /* Type-cast. (1) */  
    if (z ___=___ 0) /* Check equality with zero. (1) */  
        printf("x=____%f __, y=____%f ____\n", __x__, __y__); /* Print values of x, and y. (1) */  
}
```

**Guide to Marking:** Mark each statement out of 1 independently. No partial marks to be awarded in each case.

2. The RAM size of a computer is 64Mbytes. How many char type data can it store? Show steps of your calculation. [2 Marks]

1 Character occupies 1 byte.

Number of character data that can be stored = 64 Mbytes/1byte =

[1 Mark]

64X2<sup>20</sup>

[1 Mark]

or,

64\*1024\*1024

or,

68,719,476,736

**Guide to Marking:** Any equivalent answer should be accepted.

3. Write a C-program to print the first ten multiples of 5 using a **while** loop.

[5 Marks]

[Sample Output : 5 10 15 20 25 30 35 40 45 50]

```
#include <stdio.h>
main(){
    int i=5;

    while(i<=50){
        printf("%d\t", i);
        i=i+5;
    }
    printf("\n");
}
```

**Guide to Marking:** Other equivalent code using while loop should be accepted.

4. Consider the following snippet of a c-program for which **int** and **unsigned** data-types are represented by **8-bits** each . Write the minimum and maximum possible values which can be correctly stored in the variables **a** and **b**. Show details of your steps. [4 Marks]

```
int main (){

    int a;
    unsigned b;

    . . . .
}
```

int a: i) largest  $2^7 - 1$             ii) minimum:  $- 2^7$   
unsigned a: iii) largest  $2^8 - 1$         iv) minimum: 0

**Guide to Marking::** 1 mark for each part of the answer

5. Consider the following code:

```
int main(){

int a = 0, b = 100;

    if (a)
        if (b) printf("abc\n");
        else printf("bcd\n");
}
```

What will be the output generated by the above code? Also explain your reasoning in one sentence. (3)

**Ans:**

Output:            No output            [ 1 Mark]

Reason: The expression for first if evaluates to false, so the second if-else will not be executed. (The student Should explain why the else part is not executed.)            No partial marking.            [2 Mark]

(b) What will be the output generated by the above code when **a = -100** and **b = 100**? Also explain your reasoning in one sentence. (2)

Output: abc

Reason: The expressions for both if statements evaluate to true..

6. Convert the following decimal numbers into 2's complement 8-bit integer representations.  
-37, 79 (3+2)

(a) -37:

37 → 37/2 = 18 → 1  
18/2 = 9 → 0  
9/2 = 4 → 1  
4/2 = 2 → 0  
2/2 = 1 → 0  
1/2 = 0 → 1

Hence: 37 → 00100101 (in 8 bit)

-37 = 2's complement of 37 = 1's complement of 37 + 1 =

11011010

+ 1

---

11011011 (ans.)

**Guide to Marking:** (i) Mark 0 if 2's complement steps are not shown, even if the answer is correct.  
(ii) No partial marks.

(b) 79 → 79/2 = 39 → 1  
39/2 = 19 → 1  
19/2 = 9 → 1  
9/2 = 4 → 1  
4/2 = 2 → 0  
2/2 = 1 → 0  
1/2 = 0 → 1

Hence: 79 → 01001111 (Ans.)

**Guide to Marking:** If the answer is not provided in 8 bits (i.e. 0 missing at MSB), deduct 1. Full marks to be awarded, even if steps are not shown in this case.

7. Consider the following C-code which intends to compute simple interest on an amount of Rs. 2000/- for a period of four years at simple interest rate of 10.5% per annum. (3 + 2)

```
# include <stdio.h>
int main () {

    int amount = 2000;
    int time = 4 ;
    float rate = 10.5;
```

```

float simInt;

simInt = time/100 * amount * rate;

printf("Interest on Rs %d at %f per annum for %d y = %d\n",
      amount, rate, time, simInt);

return 0;
}

```

What will be the output given generated by the above code? Write the reason(s) in one sentence.

Ans: Interest on Rs. 2000 at 10.5 per annum for 4 y = 0

[1 Mark]

Reason: Integer division of time/100 results in 0

[ 2 Marks]

Modify the above code so that you get the correct output. Explain your answer in one sentence.

Ans: `simInt = amount * rate * time/100;`

or

```
simInt = ((float)time/100) * amount * rate;
```

or

```
simInt = (time/100.0) * amount * rate;
```

Reason: In either of the solutions floating point division occurs.

**Guide to Marking: Any of the equivalent answer should be accepted.**

8. In the following code snippet , replace the while loop by a for loop. Your program should produce identical output after you replace the statements commented "Replace With a for loop". (4)

```

int i;
int j=5;
int sum=0;
while(sum<10000){
    sum=sum+i*j;
    i++;
}
printf("%d %d \n",sum,i,j);

```

/\* Replace \*/  
/\* With a \*/  
/\* for \*/  
/\* loop \*/

Ans:

```
int i;
```

```
int j=5;
```

```
for(sum=0;sum<10000;i++)
```

```
    sum=sum+i*j;
```

```
printf("%d %d \n",sum,i,j);
```

### Guide to Marking:

There could be other variations also which should be accepted.

9. For the following list of identifiers, tick the ones that are valid and cross out the ones that are invalid: If any is invalid, briefly write the reason why it is invalid. (4)

break  
  1  
While  
ink^jet

Ans:

**B and c are TRUE, the rest (a and d) are FALSE**

**Reason:** break is a keyword and therefore not accepted. ink^jet contains the special character ^ and therefore not accepted.

**Marking guideline: No marks to be awarded for not stating reason for “False”.**

10. What would be the output of the following program? In one sentence justify your answer. (2)

```
main(){  
    printf("Expression values = %d %d\n", 5/2*2, 2+5/2*3-1);  
}
```

Ans:

4 7

[1 Mark]

Reason: Integer division is used.

[1 Mark]

11. Consider an  $n$  bit binary number. If the number is to be encoded in Octal, how many Octal digits would be required approximately? (2)

Ans: Ceil( $n/3$ )

Marking guide: Award 1 Mark if answer is  $n/3$  or floor( $n/3$ )

12. What will be printed when the following program is executed with 75 and 35 as the keyboard inputs? What does the program compute? (4+1)

```
#include <stdio.h>  
main(){  
    int x, int y ;  
    printf("Enter two numbers: " ) ;  
    scanf("%d%d", &x, &y);  
    while(x!=y){  
        if(x>y) x-=y;  
        else y-=x;
```

```

        printf("x=%d y=%d\n",x,y);
    }
    printf("%d\n",x);
}

```

Ans:

X=40 y=35 -----

X=5 y=35 -

X=5 y=30 -

X=5 y=25 [ 2 Marks]

X=5 y=20 -

X=5 y=15 -

X=5 y=10 -

X=5 y=5 -----

5 [ 2 Marks]

The program computes GCD (Or HCF).

**Guide to Marking: Partial marks can be awarded for the first part.**

13. How many times will the print statement be executed? [2]

```

for(i=0;i<=99;i++)
    for(j=i;j<100;j++)
        printf("Class Test 1\n");

```

Ans:  $100+99+98+ \dots +1 = 100*101/2=5050$

**Marking guideline:** Award only one mark if the steps are not shown and the answer is correct otherwise.

---The End ---