	INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
	Programming in C and C++ (CSC-101)

Assignment 2 (Basics of printf)

Garv
25114035

Q-1) Write a C program to print the following using a single printf statement.

[5 marks]

```
*********
*       *
*       *
*       *
*       *
*       *
*       *
*       *
*       *
*********
```

garvmehta991@omnitrix-1000: ~/25114035/Assignment2/Question1 — ☐ ✕

```c
#include<stdio.h>

int main() {
        printf("*********\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        printf("*       *\n");
        pritnf("*********\n");

        return 0;
}
~
~
~
~
-- INSERT --                                          15,2            All
```

garvmehta991@omnitrix-1000: ~/25114035/Assignment2/Question1 — ☐ ✕

```
garvmehta991@omnitrix-1000:~/25114035$ pwd
/home/garvmehta991/25114035
garvmehta991@omnitrix-1000:~/25114035$ mkdir Assignment2
garvmehta991@omnitrix-1000:~/25114035$ cd Assignment2
garvmehta991@omnitrix-1000:~/25114035/Assignment2$ mkdir Question{1..5}
garvmehta991@omnitrix-1000:~/25114035/Assignment2$ cd Question1
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ touch q1.c && vim q1.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ gcc q1.c -o q1
q1.c: In function 'main':
q1.c:12:9: warning: implicit declaration of function 'pritnf'; did you mean 'printf'? [-Wimplicit-function-declaration]
   12 |         pritnf("*********\n");
      |         ^~~~~~
      |         printf
/usr/bin/ld: /tmp/ccCb4o8t.o: in function `main':
q1.c:(.text+0x90): undefined reference to `pritnf'
collect2: error: ld returned 1 exit status
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ vim q1.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ gcc q1.c -o q1
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ ./q1
*********
*       *
*       *
*       *
*       *
*       *
*       *
*       *
*       *
*********
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question1$ █
```

Q-2) Write a C program to print your Name, Roll No and Branch on the terminal. Compare the *preprocessed file, assembly file and object file* generated using the *gcc* command. Explain your observation.   [10 marks]

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2

#include<stdio.h>

int main() {
        printf("Name:Garv \nRoll No:25114035 \nBranch:CSE \n");
        return 0;
}
~

                                                        6,1              All
```

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ touch q2.c && vim q2.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ gcc -E q2.c -o q2.i
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ gcc -S q2.i -o q2.s
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ as q2.s -o q2.o
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ gcc q2.o -o q2
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ la
q2   q2.c   q2.i   q2.o   q2.s
```

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ cat q2.c
#include<stdio.h>

int main() {
        printf("Name:Garv \nRoll No:25114035 \nBranch:CSE \n");
        return 0;
}
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$
```

struct _IO_FILE;

typedef struct _IO_FILE FILE;
44 "/usr/include/stdio.h" 2 3 4
1 "/usr/include/x86_64-linux-gnu/bits/types/struct_FILE.h" 1 3 4
35 "/usr/include/x86_64-linux-gnu/bits/types/struct_FILE.h" 3 4
struct _IO_FILE;
struct _IO_marker;
struct _IO_codecvt;
struct _IO_wide_data;

typedef void _IO_lock_t;

struct _IO_FILE
{
  int _flags;

  char *_IO_read_ptr;
  char *_IO_read_end;
  char *_IO_read_base;
  char *_IO_write_base;
  char *_IO_write_ptr;
  char *_IO_write_end;
  char *_IO_buf_base;
  char *_IO_buf_end;

  char *_IO_save_base;
  char *_IO_backup_base;
  char *_IO_save_end;

  struct _IO_marker *_markers;

  struct _IO_FILE *_chain;

  int _fileno;
  int _flags2;
  __off_t _old_offset;

  unsigned short _cur_column;
  signed char _vtable_offset;
  char _shortbuf[1];

  _IO_lock_t *_lock;
  __off64_t _offset;

  struct _IO_codecvt *_codecvt;
  struct _IO_wide_data *_wide_data;
  struct _IO_FILE *_freeres_list;
  void *_freeres_buf;
  size_t __pad5;
  int _mode;

  char _unused2[15 * sizeof (int) - 4 * sizeof (void *) - sizeof (size_t
)];
};
# 45 "/usr/include/stdio.h" 2 3 4

1 "/usr/include/x86_64-linux-gnu/bits/types/cookie_io_functions_t.h" 1
 3 4
27 "/usr/include/x86_64-linux-gnu/bits/types/cookie_io_functions_t.h"
 3 4
typedef __ssize_t cookie_read_function_t (void *__cookie, char *__buf,
                                          size_t __nbytes);

typedef __ssize_t cookie_write_function_t (void *__cookie, const char *
__buf,
                                           size_t __nbytes);

typedef int cookie_seek_function_t (void *__cookie, __off64_t *__pos, in
t __w);

typedef int cookie_close_function_t (void *__cookie);

typedef struct _IO_cookie_io_functions_t
{
  cookie_read_function_t *read;
  cookie_write_function_t *write;
  cookie_seek_function_t *seek;
  cookie_close_function_t *close;
} cookie_io_functions_t;
48 "/usr/include/stdio.h" 2 3 4
typedef __gnuc_va_list va_list;
64 "/usr/include/stdio.h" 3 4
typedef __off_t off_t;
78 "/usr/include/stdio.h" 3 4
typedef __ssize_t ssize_t;

typedef __fpos_t fpos_t;
129 "/usr/include/stdio.h" 3 4
1 "/usr/include/x86_64-linux-gnu/bits/stdio_lim.h" 1 3 4
130 "/usr/include/stdio.h" 2 3 4
149 "/usr/include/stdio.h" 3 4
extern FILE *stdin;
extern FILE *stdout;
extern FILE *stderr;

extern int remove (const char *__filename) __attribute__ ((__nothrow__ ,
 __leaf__));
extern int rename (const char *__old, const char *__new) __attribute__ (
(__nothrow__ , __leaf__));

extern int renameat (int __oldfd, const char *__old, int __newfd,
                     const char *__new) __attribute__ ((__nothrow__ , __leaf__));
184 "/usr/include/stdio.h" 3 4
extern int fclose (FILE *__stream) __attribute__ ((__nonnull__ (1)));
194 "/usr/include/stdio.h" 3 4
extern FILE *tmpfile (void)
  __attribute__ ((__malloc__)) __attribute__ ((__malloc__ (fclose, 1)))
;
211 "/usr/include/stdio.h" 3 4
extern char *tmpnam (char[20]) __attribute__ ((__nothrow__ , __leaf__))
;

extern char *tmpnam_r (char __s[20]) __attribute__ ((__nothrow__ , __lea
f__)) ;
228 "/usr/include/stdio.h" 3 4
extern char *tempnam (const char *__dir, const char *__pfx)
  __attribute__ ((__nothrow__ , __leaf__)) __attribute__ ((__malloc__))
  __attribute__ ((__malloc__ (__builtin_free, 1)));
extern void perror (const char *__s) __attribute__ ((__cold__));

extern int fileno (FILE *__stream) __attribute__ ((__nothrow__ , __leaf_
_)) __attribute__ ((__nonnull__ (1)));

extern int fileno_unlocked (FILE *__stream) __attribute__ ((__nothrow__
, __leaf__)) __attribute__ ((__nonnull__ (1)));
897 "/usr/include/stdio.h" 3 4
extern int pclose (FILE *__stream) __attribute__ ((__nonnull__ (1)));

extern FILE *popen (const char *__command, const char *__modes)
  __attribute__ ((__malloc__)) __attribute__ ((__malloc__ (pclose, 1)))
;

extern char *ctermid (char *__s) __attribute__ ((__nothrow__ , __leaf__)
);
941 "/usr/include/stdio.h" 3 4
extern void flockfile (FILE *__stream) __attribute__ ((__nothrow__ , __l
eaf__)) __attribute__ ((__nonnull__ (1)));

extern FILE *ftrylockfile (FILE *__stream) __attribute__ ((__nothrow__ ,
 __leaf__)) __attribute__ ((__nonnull__ (1)));

extern void funlockfile (FILE *__stream) __attribute__ ((__nothrow__ , _
_leaf__)) __attribute__ ((__nonnull__ (1)));
959 "/usr/include/stdio.h" 3 4
extern int __uflow (FILE *);
extern int __overflow (FILE *, int);
983 "/usr/include/stdio.h" 3 4

2 "q2.c" 2

# 3 "q2.c"
int main() {
    printf("Name:Garv \nRoll No:25114035 \nBranch:CSE \n");
    return 0;
}
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ cat q2.s

```
        .file   "q2.c"
        .text
        .section        .rodata
        .align 8
.LC0:
        .string "Name:Garv \nRoll No:25114035 \nBranch:CSE "
        .text
        .globl  main
        .type   main, @function
main:
.LFB0:
        .cfi_startproc
        endbr64
        pushq   %rbp
        .cfi_def_cfa_offset 16
        .cfi_offset 6, -16
        movq    %rsp, %rbp
        .cfi_def_cfa_register 6
        leaq    .LC0(%rip), %rax
        movq    %rax, %rdi
        call    puts@PLT
        movl    $0, %eax
        popq    %rbp
        .cfi_def_cfa 7, 8
        ret
        .cfi_endproc
.LFE0:
        .size   main, .-main
        .ident  "GCC: (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0"
        .section        .note.GNU-stack,"",@progbits
        .section        .note.gnu.property,"a"
        .align 8
        .long   1f - 0f
        .long   4f - 1f
        .long   5
0:
        .string "GNU"
1:
        .align 8
        .long   0xc0000002
        .long   3f - 2f
2:
        .long   0x3
3:
        .align 8
4:
```

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ cat q2.o

UH]Name:Garv
Roll No:25114035
Branch:CSE GCC: (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0GNUzRx
U   EC

   q2.cmainputs
                      .symtab.strtab.shstrtab.rela.text.data.bss.rodata.comment.note.GNU-stack.note.gnu.property.rela.eh_frame
                      &^^1900,BRj0e@

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2 — □ ✕
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$ ./q2
Name:Garv
Roll No:25114035
Branch:CSE
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question2$
```

Q-3) You are working as a software intern at a company. One of your tasks is to write lightweight and efficient C code which contains only printf() statements for logging, debugging, and feature-specific outputs that can be easily enabled or disabled at compile time using preprocessor directives. Write an appropriate C program for the same using preprocessor directives.   [20 marks]

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3
#include <stdio.h>

#define MODE 1

int main() {
        if (MODE == 0) {
                printf("LOGGING is enabled");
        } else if (MODE == 1) {
                printf("DEBUGGING is enabled");
        } else if ( MODE >=1 ) {
                printf("FEATURE-SPECIFIC is enabled");
        }

        return 0;
}

~
~
"q3.c" 16L, 243B                                    16,0-1        All
```

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3$ vim q3.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3$ gcc q3.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3$ ./a.out
DEBUGGING is enabled
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question3$
```

Q-4) Write code in C language to print the following outputs using a single print statement:

[20 marks]

a. Hello World
b. "Hello World"
c. This is \n a line
d. How   are   you (without manually giving spaces)
e. Bank provides 10% interest
f. Hello
        World!   (using a single printf statement)
g. ??!
h. Good /\ Day!
i. For printing \n we use \\n
j. "He"llo wo"rld


```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4 — □ ✕

#include <stdio.h>

int main() {
        printf("Hello World\n");
        printf("\"Hello World\"\n");
        printf("This is a \\n line\n");
        printf("How\tare\tyou\n");
        printf("Bank provides 10%% interest");
        printf("Hello\n\tWorld!\n");
        printf("??!");
        printf("Good /\\ Day!");
        printf("For printing \\n we use \\\\n\n ");
        printf("\"He\"llo wo\"rld\n");
        return 0;
}
~

                                        13,24-31          All
```



```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4          — □ ✕

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ touch q4.c && vim q4.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ gcc q4.c
q4.c: In function 'main':
q4.c:10:17: warning: trigraph ??! ignored, use -trigraphs to enable [-Wtrigraphs]
   10 |        printf("??!");
      |
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ ./a.out
Hello World
"Hello World"
This is a \n line
How     are     you
Bank provides 10% interestHello
        World!
??!Good /\ Day!For printing \n we use \\n
 "He"llo wo"rld
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ gcc -Wall q4.c
q4.c: In function 'main':
q4.c:10:17: warning: trigraph ??! ignored, use -trigraphs to enable [-Wtrigraphs]
   10 |        printf("??!");
      |
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ ./a.out
Hello World
"Hello World"
This is a \n line
How     are     you
Bank provides 10% interestHello
        World!
??!Good /\ Day!For printing \n we use \\n
 "He"llo wo"rld
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question4$ █
```

Q-5) Write a C program to print "Hello World" without using a semicolon.   [15 marks]

```c
#include<stdio.h>

int main() {
        if(printf("Hello Wolrd\n"))
                return 0;
}
```

```
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question5$ vim q5.c

garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question5$ gcc q5.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question5$ l
a.out*  q5.c
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question5$ ./a.out
Hello Wolrd
garvmehta991@omnitrix-1000:~/25114035/Assignment2/Question5$
```