Do not copy and paste the code. All the submissions in the lab have to be created manually. The paper version (if distributed) should be returned in class with the name and the student ID. The final result should be uploaded on D2L using lab07.txt.

Name: _____ Student ID: _____ Class: _____

Instructor: Jong-Kyou Kim, PhD _____

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1. The following program uses `#define` of C compilers. Show the output of the following program.

   (a)

```
#include <stdio.h>

#define NUM 10

void main() {
  int buf[NUM];

  for (int i = 0; i < NUM; i++) {
    buf[i] = 2*i + 1;
  }
  for (int i = 0; i < NUM; i++) {
    printf("buf[%d] = %d\n", i, buf[i]);
  }
}
```

   (b)

```
#include <stdio.h>
#define FIVE 2+3

void main() {
  printf("FIVE=%d\n", FIVE);
  printf("FIVE*FIVE=%d\n", FIVE*FIVE);
}

```

2. The following program uses `typedef` of C compilers. Show the output of the following program.

   (a)

```c
#include <stdio.h>

typedef unsigned char mybyte;

void main() {
  mybyte i = 16,j = 16, k;
  k = i * j;
  printf("i*j = %d\n", i*j);
  printf("k = %d\n", k);
  printf("sizeof(mybyte)=%lu\n", sizeof(mybyte));
  printf("sizeof(i)=%lu\n", sizeof(i));
  printf("sizeof(j)=%lu\n", sizeof(j));
}
```

(b)

```c
#include <stdio.h>

typedef char string100[100];

void main() {
  string100 s = "100 characters";
  printf("s='%s'\n",s);
  printf("sizeof(string100)=%lu\n", sizeof(string100));
  printf("sizeof(s)=%lu\n", sizeof(s));
}
```

3. The following program creates a text file named `tmp.txt`. The stored data could be read either as an integer or a string. Show the output of the program.

```c
#include <stdio.h>

void main() {
  FILE* fp = fopen("tmp.txt", "w");
  char buf[BUFSIZ];
  int n = 0;
  fprintf(fp, "15\n");
  fclose(fp);
  fp = fopen("tmp.txt", "r");
  fscanf(fp, "%d", &n);

  printf("n*2 = %d\n", n*2);
  fclose(fp);
  fp = fopen("tmp.txt", "r");
  fscanf(fp, "%s", buf);
  buf[0] = '\n';
  printf("buf = %s\n", buf);
  fclose(fp);
}
```

4. The following program uses the functions declared in `string.h`. Show the output of the following prorogram.

```
#include <stdio.h>
#include <string.h>

void main() {
  char str1[] = "Hello";
  char str2[] = "Hello";
  char str3[] = "Allo";
  printf("1: %s\n", str1 == str2 ? "true" : "false");
  printf("2: %s\n", strcmp(str1, str2) == 0 ? "true" : "false");
  printf("3: %s\n", strcmp(str2, str3) == 0 ? "true" : "false");
  printf("4: %s\n", strcmp(str2, str3) < 0 ? "true" : "false");
  printf("5: %d\n", strcmp(str2, str3));
}
```

5. The following program uses the functions declared in `ctype.h`. Show the output of the following prorogram.

```
#include <stdio.h>
#include <string.h>
#include <ctype.h>

void main() {
  int digit = 0,
    alpha = 0,
    alnum = 0,
    xdigit = 0,
    lower = 0,
    upper = 0,
    space = 0,
    punct = 0,
    graph = 0;
  char str[] = "David's id is 31, which is 0x1F.";
  char* p = str;
  for(; *p; p++) {
    if (isdigit(*p)) {
      digit++;
    }
    if (isalpha(*p)) {
      alpha++;
    }
    if (isalnum(*p)) {
      alnum++;
    }
    if (isxdigit(*p)) {
```

```
28          xdigit++;
29        }
30        if (islower(*p)) {
31          lower++;
32        }
33        if (isupper(*p)) {
34          upper++;
35        }
36        if (ispunct(*p)) {
37          punct++;
38        }
39        if (isgraph(*p)) {
40          graph++;
41        }
42      }
43      printf("strlen(str) = %lu\n", strlen(str));
44      printf("digit=%d\n", digit);
45      printf("alpha=%d\n", alpha);
46      printf("alnum=%d\n", alnum);
47      printf("xdigit=%d\n", xdigit);
48      printf("lower=%d\n", lower);
49      printf("upper=%d\n", upper);
50      printf("space=%d\n", space);
51      printf("punct=%d\n", punct);
52      printf("graph=%d\n", graph);
53    }
```