Practice final problems on strings, recursion, structure types and dynamic memory allocation

1. What is the value of t1 after execution of these statements if the value of t2 is "Merry Christmas"?

strncpy(t1, &t2[3], 5); t1[5]='\0';

- 2. Write statements that take a whole data line as input and display all the uppercase letters in the line.
- 3. What is the value of variable \mathbf{s} after execution of the program fragment below?

```
char h[6] = "wild";
char p[6] = "crazy";
char s[10];
strcpy(s, h);
strcat(s, p);
```

4. What is accompolished by the following statement, assuming that ch1 is of type char, str1 references a 10element char array, and n is of type int?

sscanf("a number 11", "%c%s%d", &ch1, str1, &n);

5. Describe the flaw in the following function

```
/* Forms the plural of noun by adding an 's'. */
char *
add_s(const char *noun)
{
     char result[100];
     strcpy(result, noun);
     strcat(result, 's');
     return (result);
}
```

6. What is returned by the calling following recursive function when n is 13?

```
int
two(int n)
{
    int ans;
    if (n == 1)
        ans = 0;
    else
        ans = 1 + two(n / 2);
    return (ans);
}
```

```
int
fox(int m, int n)
{
    int ans;
    if (m < 10)
        if (n < 10)
            ans = m + n;
        else
            ans = fox(m, n-2) + n;
else
        ans = fox(m-1, n) + m;
return (ans);
}</pre>
```

- (a) What is the value of fox(11,11)?
- (b) What is the terminating condition?
- 8. What the action of the following function

```
void
fun(int n)
{
    if (n > 0){
        fun( n / 10)
        printf("%d ", n % 10):
    }
}
```

9. Complete the following function for calculating the value of a number (base) raised to a power. Assume that power is positive.

```
int
raise_to_power(int base, int power)
{
    int ans;
    if (power == _____)
        ans = ______)
        else
        ans = ______* ____;
return ans;
}
```

10. Write a function named duplicate that uses dynamic storage allocation to creat a copy of a string. For example, the call

p = duplicate(str)

would allocate space for a string of the same length as str, copy the contents of str into the new string, and return a pointer to it. Have duplicate return a null pointer if the memory allcation fails.

11. Write the following function

int *creat_array(int n, int initial_value);

The function should return a pointer to a dynamically allocated int array n members, each of which is initialized to initial_value. The return value should be NULL if the array can't be allocated.

12. Define the following type students_t and variables stu1 and stu2.

```
typedef struct{
    char fst_name[20], last_name[20];
    int score;
    char grade;
} student_t;
....
student_t stu1, stu2;
```

(a) Identify the following statements as possibly valid or definitely invalid. If invalid, explain why

```
student_t stulist[30];
printf("%s",stu1);
printf("%d %c", stu1.score, stu1.grade);
stu2 = stu1;
if( stu2.score == stu1.score )
    printff("Equal");
if (stu2 == stu1)
    printf("Equal structures");
scan_student(&stu1);
```

stu2.last_name = "Martin";

- (b) Write a statement that displays the initials of stu1 with period.
- (c) How many components does variable stu2 have?
- (d) Write functions scan_student, which fills a type student_t structure with input data.
- (e) Write function print_student that displays with labels of all components of a student_t structure.
- (f) Declare an array of 40 student_t structures, and write a code segment that displays on separate lines the name (last name, first name) of all the students in the list.
- (g) Identify the type of each of the following references:

```
stu1
stu2.score
stu2.fst_name[3]
stu1.grade
```