EECS-22: Advanced C Programming Quiz 2 (20 Minutes)
Dynamic Memory and Pointers
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1. **Which of the following statements about pointers is/are correct? (Select all that apply)**

   (a) **Pointers can be assigned the address of another variable.**

   (b) **Pointers can be NULL.**

   (c) Pointers automatically de-allocate memory when reassigned.

   (d) Pointers are always initialized to NULL (not to a random memory address) by default.

2. **Which of the following expressions are valid ways to access array elements using pointers? (Select all that apply)**

   (a) `*(arr + i)`

   (b) `*(i + arr)`

   (c) `arr[i]`

   (d) `*arr[i]`

3. **What is the output of the following code?**

```
1    int arr[] = {10, 20, 30};
2    int *ptr = arr;
3    printf("%d", *(ptr+1));
4
```

   (a) 10

   (b) **20**

   (c) 30

   (d) Garbage value

4. **Which of the following are valid ways to pass a pointer to a function? (Select all that apply)**

   (a) **By value (copy of the pointer)**

   (b) By reference

   (c) **Using the pointer's address**

   (d) **Using a void pointer**

5. **Which of the following causes a segmentation fault? (Select all that apply)**

   (a) **De-referencing a NULL pointer**

   (b) **Accessing memory out of bounds**

   (c) Using an uninitialized pointer

   (d) **Releasing memory twice with `free()`**

6. **Which of the following statements about pointer arithmetic is/are correct? (Select all that apply)**

   (a) **Pointer increment depends on data type size.**

   (b) **Pointer subtraction gives the number of elements between two pointers.**

   (c) Adding two pointers is allowed in C.

   (d) **Pointer comparison is valid within the same array.**

7. **What is the output of the following code?**

```
1        #include <stdio.h>
2        int main() {
3            int a = 10;
4            int *p = &a;
5            *p = 20;
6            printf("%d", a);
7            return 0;
8        }
9
```

   (a) 10

   (b) **20**

   (c) Garbage value

   (d) Compilation error

8. **Which of the following can lead to undefined behavior? (Select all that apply)**

   (a) **Accessing memory after calling `free()`**

   (b) **De-referencing an uninitialized pointer**

   (c) Using a void pointer for arithmetic

   (d) **Returning a pointer to a local variable**

9. **Which of the following are correct declarations of pointer arrays? (Select all that apply)**

   (a) `int *arr[10];`

   (b) `int arr[10]*;`

   (c) `int (*arr)[];`

   (d) `int **arr;`

10. **What is the output of the following code?**

```
1    int x = 5;
2    int *p = &x;
3    x++;
4    printf("%d", *p);
5
```

    (a) 4

    (b) **6**

    (c) 5

    (d) Garbage value

11. **Which of the following can point to any data type? (Select all that apply)**

    (a) `void *`

    (b) `int *`

    (c) `char *`

    (d) `float *`

12. **Why do we cast the return value of `malloc()` in C? (Select all that apply)**

    (a) **To change the pointer's data type from `void *` to a specific type.**

    (b) It changes the data stored in memory.

    (c) It is mandatory in C.

    (d) **To make the code readable and maintainable.**

13. **Which of the following statements are correct about memory leaks? (Select all that apply)**

    (a) **They occur when dynamically allocated memory is not freed.**

    (b) They are automatically resolved when a program exits (they'll not affect other programs)

    (c) **They can be detected using tools like Valgrind.**

    (d) They occur only in C++.

14. **Which of the following are valid pointer declarations? (Select all that apply)**

    (a) `int *p;`

    (b) `float p;`

    (c) `char *p = NULL;`

    (d) `double ptr();`

15. **Which of the following operations are allowed on pointers? (Select all that apply)**

    (a) **Pointer increment and decrement**

    (b) **Pointer comparison**

    (c) Adding two pointers

    (d) **Subtracting two pointers**