Programming and Data Structures (Autumn 2024–25)

Full marks = 30   **Class Test 1**   **Time = 1 hour**

Answer all. Write the answers in the blanks or boxes only.

NAME: ——————————————— ROLL NO.: ——————————— SEC.: ——

1. For each of the following sets containing some data types and variables in C, **underline** the odd element (the element that does not align with the characteristics of the other set members). $\boxed{4 \times 1 = 4 \text{ marks}}$

  i) {int, float, char, string, xyz}

  ii) {_123, -X123, #X123, 123X, 123}

  iii) {void, null, exit, break, goto, from}

  iv) {&&, ||, &, !}

————————————————————————| **ANSWER** |————————————————————————

xyz (reason: it's a legal variable name, but the rest are keywords or standard concepts in C)
_123 (reason: it's a legal variable name, but the rest are not)
from (reason: it's not a valid keyword in C, but the rest are)
& or ! (reason for &: it's a bitwise operator, but the rest are logical operators.
       reason for !: it's a unary operator, but the rest are binary operators.)

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2. Write the output for the following piece of code. $\boxed{6 \times 1 = 6 \text{ marks}}$

```c
int a=1, b=2, c;
printf("%d, %d, %d, ", a&b, a&&b, (a&b)&&(a&&b));
printf("%d, %d, %d\n", (a+5)|(b+5), a/2 + b/3, c = (a/2 == b/3));
```

ANSWER: 0, 1, 0, 7, 0, 1

———————————————— **Space for rough work** ————————————————

3. Given the height (at most 26) of a pyramid, the following code prints the pyramid with the uppercase English alphabet. Fill up the blanks. For heights 1, 2, 3, 5, they'll look as follows: $1 \times 4 = 4$ marks

```
        A                A                A                           A
                       A B A            A B A                       A B A
                                      A B C B A                   A B C B A
                                                               A B C D C B A
                                                             A B C D E D C B A
```

```c
#include <stdio.h>

int main(){
  int n, i, j, k, space;
  char c;

  printf("Enter the height of the pyramid: ");
  scanf("%d", &n);

  for (i=0, k=1; i<n; i++){

    c = _____;
    for(space=1; space<=n-i; space++)
      printf("  ");
    for (j=0; j<1+k/2; j++)

      printf("%c ", _____);
    c = c-2;
    for (j=0; j<k/2; j++)
      printf("%c ", _____);

    _____;
    printf("\n");
  }
  return 0;
}
```

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```c
c = 'A';
printf("%c ", c++);
printf("%c ", c--);
k += 2;
```

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4. What will be the output of the print statement in the following code? 3 marks

```c
#include <stdio.h>
int main() {
  int a=1, b=2, c=0;
  a = a + b;
  b = b % a;
```

2

```
    a = a + a / b * a;
    a = a + (a / b) * a;
    a = ++a + b++;
    c += a % b + b + a;
    c += a % b + (b + a);
    printf("a = %d, b = %d, c = %d\n", a++, b, c);
    return 0;
}
```

ANSWER: a = 27, b = 3, c = 60

5. Fill in the blanks in the following code. Its task is to find the second largest element of a given array. $\boxed{\text{4 marks}}$

```
#include <stdio.h>

int findSecondLargest(int arr[], int size) {
    int largest = arr[0], secondLargest = arr[0];
    for (int i = 1; i < size; i++) {
        if (arr[i] > largest) {

            _____ = largest;  // 2 marks

             largest = arr[i];
        }
        else if (arr[i] > secondLargest && arr[i] < largest) {

            _____;  // 2 marks
        }
    }
    return secondLargest;
}

int main(){
    int array[] = {7, 2, 8, 9, 5, 6};
    int size = 6;
    printf("Second Largest = %d\n", findSecondLargest(array, size));
    return 0;
}
```

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secondLargest
secondLargest = arr[i]

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6. Given two numbers a and b as input, the following program has to compute the value of $a^4 b^5$, using four multiplications in total, without using any extra variable, and without using the math library. Fill up the blanks so that each blank contains exactly one statement. $\boxed{4 \times 1 = 4 \text{ marks}}$

```c
#include <stdio.h>

int main(){
  float a, b;

  printf("Enter the values of a and b: ");
  scanf("%f%f", &a, &b);

  _____ // [1 mark]

  _____ // [1 mark]

  _____ // [1 mark]

  _____ // [1 mark]

  printf("Answer = %f\n", a);
  return 0;
}
```

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```c
a = a*b;
a = a*a;
a = a*a;
a = a*b;
```

7. What is the output of the following program? $\boxed{10 \times \frac{1}{2} = 5 \text{ marks}}$

```c
#include <stdio.h>
int main(){
  int k;
  for (k=0; k<10; k++)
    printf("%d  ", (k%3) ? k : k*3);
  return 0;
}
```

ANSWER: 0 1 2 9 4 5 18 7 8 27

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