1. **Primitive Data Types and Control Statements**

(a) Java has four primitive integer variable data types. The smallest of which is a `byte` (8 bits). Give the binary and decimal representation of both the largest and the smallest value a `byte` can hold. [2]

(b) Floating point numbers in Java are represented using IEEE-754 notation. Given an 8-bit floating point number, where the exponent is 3 bits and the fraction is 4 bits, and the number is calculated using the formula:

$$(\text{sign})1.(\text{fraction}) \times 2^{(\text{exponent}-3)}$$

calculate the value of the number 01101100. [5]

(c) The following code will not compile. Explain why this is the case and give two valid ways to resolve the error. [3]

```
public static void main(String args[]) {
    double a = 8374;
    int b = a;
    System.out.println(b);
}
```

(d) Program control in Java can be managed using `if` and `switch` statements. Rewrite the following code in the most concise form possible using an `if-else` statement. [5]

```
switch (a) {
    case 4: System.out.println("Option 4");
    case 2: System.out.println("Option 2");
            break;
    case 1: System.out.println("Option 1");
    default: System.out.println("Default");
}
```

(e) Given `x = 0`, determine the validity and the truth value of the following statements, as well as the value of `x` following evaluation.

i. `(x == 0) || (x++ < 2)`

ii. `(x > 2) & (x++ < 2)`

iii. `(x != 0) & ((100 / x) != 2)`

[5]