Review Questions (2 questions from each course)

Programming (from master document 45-46[ICSI201], 168-169[ICSI213], 249-250[ICSI311], 274[ICSI333], 375-376[ICSI405])

1. Analyze the following code segments:

   Code 1:
   int number = 45;
   boolean even;
   
   if (number % 2 == 0)
       even = true;
   else
       even = false;

   Code 2:
   int number = 45;
   boolean even = (number % 2 == 0);

   A. Code 1 has compile errors.
   B. Code 2 has compile errors.
   C. Both Code 1 and Code 2 have compile errors.
   D. Both Code 1 and Code 2 are correct, but Code 2 is better.
2. Suppose you write the code to display "Cannot get a driver's license" if age is less than 16 and "Can get a driver's license" if age is greater than or equal to 16.

Which of the following code is the best structure?

I:
if (age < 16)
   System.out.println("Cannot get a driver's license");
if (age >= 16)
   System.out.println("Can get a driver's license");

II:
if (age < 16)
   System.out.println("Cannot get a driver's license");
else
   System.out.println("Can get a driver's license");

III:
if (age < 16)
   System.out.println("Cannot get a driver's license");
else if (age >= 16)
   System.out.println("Can get a driver's license");

IV:
if (age < 16)
   System.out.println("Cannot get a driver's license");
else if (age > 16)
   System.out.println("Can get a driver's license");
else if (age == 16)
   System.out.println("Can get a driver's license");

A. I
B. II
C. III
D. IV
3. Look at the following method.

```java
public static int test2(int x, int y)
{
    if ( x < y)
    {
        return -5;
    }
    else
    {
        return (test2(x - y, y + 5) + 6);
    }
}
```

What is the recursive case for the method?

A. x < y  
B. -5  
C. x >= y  
D. x != y

4. Look at the following method.

```java
public static int test2(int x, int y)
{
    if ( x < y)
    {
        return -5;
    }
    else
    {
        return (test2(x - y, y + 5) + 6);
    }
}
```

What is returned for test2(18,5)?

A. 6  
B. -5  
C. 7  
D. 1
5. What are the three fundamental features of object oriented programming languages?
   A. Patterns, Direction, and Orientation
   B. Evaluations, validations, and expressions
   C. Simplicity, Efficiency, and Portability
   D. Encapsulation, Inheritance, and Polymorphism

6. Readability, Writability, Reliability, and Cost are
   A. Advantages of all programming languages
   B. Programming language evaluation criteria
   C. Topics of hackers' discussions
   D. Styles of an execution model

7. What does this C program output?
   ```
   void main()
   {
       int a=25, b=100, c;
       if(b++ <= (a*4)) c=3; else c=20;
       printf("%f\n", (float) (b/c));
   }
   ```

   A. 5.000000
   B. 33.000000
   C. 33.333333
   D. 33.666666
Given the following code, find the compile error?

```java
public class Test {
    public static void main(String[] args) {
        m(new GraduateStudent());
        m(new Student());
        m(new Person());
        m(new Object());
    }

    public static void m(Student x) {
        System.out.println(x.toString());
    }
}

class GraduateStudent extends Student {
}

class Student extends Person {
    public String toString() {
        return "Student";
    }
}

class Person extends Object {
    public String toString() {
        return "Person";
    }
}

A. m(new GraduateStudent()) causes an error
B. m(new Student()) causes an error
C. m(new Person()) and m(new Object()) causes an error
D. None of the above
9. The equals method is defined in the Object class. Which of the following is correct to override it in the String class?
A. public boolean equals(String other)
B. public boolean equals(Object other)
C. public static boolean equals(String other)
D. public static boolean equals(Object other)

Maths (from master document 138-139[ICSI210], 5-6[AMAT214], 18[AMAT220], 32, 36, 31, [AMAT367&370])

10. Numbers (i) 71 and (ii) 143 are:
A. Both prime
B. Both not prime
C. (i) prime and (ii) not prime
D. (i) not prime and (ii) prime
E. None of the above

11. Let \( p \) and \( q \) be the propositions “I took the placement exam” and “I passed” respectively. The English statements (i) “I didn’t take the placement exam so I didn’t pass” and (ii) “I pass the placement test if and only if I take it” can be expressed as propositions:
A. (i) \( \neg p \rightarrow \neg q \), and (ii) \( p \leftrightarrow q \)
B. (i) \( \neg p \land \neg q \), and (ii) \( p \leftrightarrow q \)
C. (i) \( \neg p \rightarrow \neg q \), and (ii) \( (p \rightarrow \neg q) \land (\neg p \rightarrow q) \)
D. (i) \( \neg p \rightarrow \neg q \), and (ii) \( (p \land q) \lor (p \land q) \)
E. (i) \( \neg p \lor \neg q \), and (ii) \( p \leftrightarrow q \)

12. Find the dot product of two vectors whose respective lengths are 6 and 5, and the angle between them is \( 2\pi/3 \).
A. -15
B. 20\(\pi\)
C. 30\(\pi\)
D. 15
E. 30
13. State whether each of the following expressions is a vector, a scalar or meaningless: (i) $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$ and (ii) $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ for vectors $\mathbf{a}, \mathbf{b},$ and $\mathbf{c},$ where $\cdot$ denotes dot product and $\times$ denotes cross product.

A. (i) Scalar and (ii) vector

B. (i) Vector and (ii) scalar

C. Both are scalar

D. Both are vectors

E. Both are meaningless

14. Let $A = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}.$ The result of $A - B^T$ is:

A. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -1 & 1 \\ 1 & 0 & -1 \\ -1 & 1 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$

E. $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

15. The expectation of a 6-face die roll is:

A. 1.5

B. 2.75

C. 3.5

D. 4.25

E. 5.0
16. Suppose the proportion \( p \) of students that will graduate with a Masters from UAlbany within 2 years is given by a random variable \( X \), with probability density function:
\[
f(p) = \begin{cases} 12p(1-p)^2, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}
\]
What is the probability, \( P(0.5 \leq X \leq 1) \), that more than half of the students will achieve this goal?
A. 0.0251
B. 0.1769
C. 0.3125
D. 0.5714
E. 0.7932

17. Suppose a friend of yours tells you they had a conversation with someone. Not knowing anything else, your prior belief that this someone was a woman is 50%, i.e., \( P(W) = 0.5 \). Suppose that your friend also tells you that this someone has long hair. Assume that the probability of someone having long hair is \( P(L) = 0.6 \), and that the probability of someone having long hair given that she is a woman is \( P(L|W) = 0.75 \). What is the probability that your friend talked to a woman?
A. 0.375
B. 0.55
C. 0.6
D. 0.625
E. 0.75

Systems (from master document 289, 305[ICSI400], 320[ICSI401], 330, 332[ICSI402], 342[ICSI403], 354,355, [ICSI404], 437-438[ICSI431])

18. Below is a line of code that executes a write system call. This code writes the contents of the buffer to a file and returns the number of bytes written. Which of the following statements below is TRUE.
\[
\text{count} = \text{write(fd, buffer, nbytes)};
\]
A. The count variable will always be set equal to nbytes
B. The count variable will always be equal to the size of the buffer.
C. The count variable will never be set equal to nbytes
D. If the user process does not have write permissions to that file, the value of count will be -1
19. A system call provides ________
   A. A standard way to call any C library from your C program
   B. An interface between the user space programs and a particular device
   C. An interface between the user space programs and the kernel
   D. A call from the operating system to the kernel

20. Suppose that we have a vector \( \mathbf{a} \) represented in a 2-dimensional space (see picture below). We want to use matrix-vector multiplication \((X \cdot \mathbf{a})\) to rotate this vector by 90 degrees counter clockwise. What should \( X \) be?
   A) \( X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \)
   B) \( X = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \)
   C) \( X = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \)
   D) \( X = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \)

21. Which value does register $t0$ holds after executing the following code:
   
   ```assembly
   addi $t0, $0, 9
   xori $t0, $t0, 8
   xori $t0, $t0, 8
   xori $t1, $t0, 8
   sll $t0, $t1, 2
   ```

   For reference, add immediate (e.g., addi $s1,$s2,20) is used to add constants, xor immediate performs bit-by-bit XOR reg with constant, and shift left logical performs shift left by constant.
   A. 0
   B. 2
22. Which expression can be used to round off a floating number \( x \) to an integer value?
   A. \( y = \text{(int)} x + 0.5 \)
   B. \( y = x + \text{(int)} 0.5 \)
   C. \( y = \text{(int)} (x + 0.5) \)
   D. \( y = x + 0.5 \)
   E. None.

23. Consider the following code segment:

   (1) \( \text{Sum} = 0; \)
   (2) \( \text{for} \ (i = 0; \ i < N; \ i++) \)
   (3) \( \text{for} \ (j = 0; \ j < i^2; \ j++) \)
   (4) \( \text{for} \ (k = 0; \ k < j; \ k++) \)
   (5) \( \text{Sum}++; \)

   The \( O() \) (big-oh) estimate for this segment is:
   A) \( O(N^2) \)
   B) \( O(N^3) \)
   C) \( O(N^4) \)
   D) \( O(N^5) \)
   E) None of the above
24. Which of the Karnaugh maps below represents the expression, \( X = AC + BC + B \)?

A) Figure I  
B) Figure II  
C) Figure III  
D) Figure IV

25. Which of the following is a key element or characteristic of a SuperScalar processor?

A) Multiple level memory hierarchy  
B) CPU clock frequencies greater than 2 GHz  
C) Mechanisms for managing and controlling out-of-order instruction execution  
D) Reduced instruction set architecture

26. Which of the following evaluation metrics can be used to evaluate a linear regression model?

A) AUC (Receiver operating characteristic)  
B) Accuracy  
C) F-Measure  
D) Mean-Squared-Error
27. Consider the following dataset

Which of the four bold points will have the largest effect on the fitted regression line as shown in the above figure (dashed line)?

A) a  
B) b  
C) c  
D) d

28. Evaluate the integral \( \int_0^3 \int_1^2 (x^2 y) \, dy \, dx \):

A. \( \frac{1}{2} \)  
B. \( \frac{3}{2} \)  
C. \( \frac{27}{2} \)  
D. \( \frac{3\sqrt{2}}{2} \)  
E. \( \frac{27\sqrt{2}}{2} \)

Review Questions Answer Keys:

1. D  
2. B  
3. C  
4. C  
5. D  
6. B  
7. B  
8. C  
9. B  
10. C