

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.

```
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. $x \geq y$
- D. $x \neq y$

4. Look at the following method.

```
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

8. Given the following code, find the compile error?

```
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) $\neg p \wedge \neg q$, and (ii) $p \leftrightarrow q$
 - C. (i) $\neg p \rightarrow \neg q$, and (ii) $(p \rightarrow \neg q) \wedge (\neg p \rightarrow q)$
 - D. (i) $\neg p \rightarrow \neg q$, and (ii) $(p \wedge q) \vee (\neg p \wedge \neg q)$
 - E. (i) $\neg p \vee \neg q$, 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. 20π
 - C. 30π
 - 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: $f(p) = \begin{cases} 12p(1-p)^2, & 0 \leq p \leq 1 \\ 0, & \text{otherwise.} \end{cases}$ 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**.
- ```
count = 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



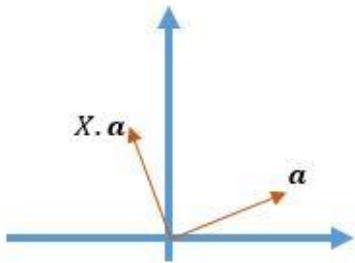
19. A system call provides \_\_\_\_\_

- 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:

```
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

C. 4

D. 8

E. 9

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) Sum = 0;
(2) for (i = 0; i < N; i++)
(3) for (j = 0; j < i*i; j++)
(4) for (k = 0; k < j; k++)
(5) 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,  $X = AC + BC + B$ ?

| $\bar{A}$ | $\bar{B}$ | $\bar{C}$ | $C$ |
|-----------|-----------|-----------|-----|
| $\bar{A}$ | $\bar{B}$ | 1         | 1   |
| $\bar{A}$ | B         | 1         | 1   |
| A         | B         | 0         | 0   |
| A         | $\bar{B}$ | 0         | 0   |

I.

| $\bar{A}$ | $\bar{B}$ | $\bar{C}$ | $C$ |
|-----------|-----------|-----------|-----|
| $\bar{A}$ | $\bar{B}$ | 0         | 1   |
| $\bar{A}$ | B         | 0         | 0   |
| A         | B         | 1         | 1   |
| A         | $\bar{B}$ | 1         | 1   |

II.

| $\bar{A}$ | $\bar{B}$ | $\bar{C}$ | $C$ |
|-----------|-----------|-----------|-----|
| $\bar{A}$ | $\bar{B}$ | 0         | 0   |
| $\bar{A}$ | B         | 1         | 1   |
| A         | B         | 1         | 1   |
| A         | $\bar{B}$ | 0         | 1   |

III.

| $\bar{A}$ | $\bar{B}$ | $\bar{C}$ | $C$ |
|-----------|-----------|-----------|-----|
| $\bar{A}$ | $\bar{B}$ | 1         | 1   |
| $\bar{A}$ | B         | 0         | 1   |
| A         | B         | 0         | 1   |
| A         | $\bar{B}$ | 1         | 1   |

IV.

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

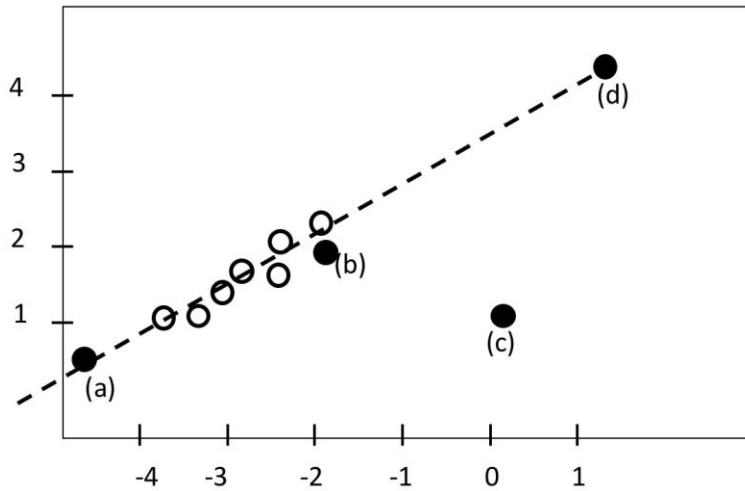
25. Which of the following is a key element or characteristic of a SuperScalar processor?

- 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.  $1/2$
  - B.  $3/2$
  - C.  $27/2$
  - D.  $\frac{3\sqrt{2}}{2}$
  - E.  $\frac{27\sqrt{2}}{2}$

Review Questions Answer Keys:

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

11. A
12. A
13. A
14. A
15. C
16. C
17. C
18. D
19. C
20. B
21. C
22. C
23. D
24. C
25. C
26. D
27. C
28. C