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UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING

FIRST SEMESTER EXAMINATIONS: 2017/2018

DEPARTMENT OF COMPUTER ENGINEERING

CPEN 201: C++ PROGRAMMING (3 Credits)

INSTRUCTIONS:
ANSWER ALL QUESTIONS FROM SECTIONS A AND B. ANSWER SECTION A ON YOUR QUESTION PAPER AND SECTION B IN YOUR ANSWER BOOKLET. WRITE YOUR *INDEX NUMBER* AND *SIGNATURE* ON ALL THE PAGES OF THE QUESTION PAPER. AT THE END OF THIS EXAMINATION, ATTACH THE FULL QUESTION PAPER TO THE ANSWER BOOKLET AND SUBMIT THEM TO THE INVIGILATOR.

TIME ALLOWED: THREE (3) HOURS

SECTION A
ANSWER ALL QUESTIONS IN THIS SECTION. CIRCLE THE CORRECT ANSWER.

1. A(n) ____ is any combination of constants, variables, and function calls that can be evaluated to yield a result.
   a. expression
   b. identifier
   c. class
   d. object

2. ____ is the first step in the program development and design phase.
   a. Developing a solution
   b. Analyzing the problem
   c. Coding the solution
   d. Testing the program

3. In C++, the expression `sum = sum + 10` can be written as ____.
   a. `sum =+ 10`
   b. `+sum = 10`
   c. `sum += 10`
   d. `sum = 10+`

4. A ____ statement is an alternative to the `if-else` chain for situations when the condition involves comparing an integer expression to a specific value.
   a. `switch`
   b. `for`
   c. `while`
   d. `do-while`

5. The expression in the `switch` statement must evaluate to a(n) ____ result or a compilation error results.
   a. character
   b. boolean
   c. integer
   d. long

6. In the `switch` statement, the ____ keyword identifies values that are compared with the `switch` expression's value.
   a. `default`
   b. `break`
   c. `case`
   d. `label`

7. The ____ statement identifies the end of a particular `case` and causes an immediate exit from the `switch` statement.
   a. `default`
   b. `break`
   c. `stop`
   d. `exit`

8. When writing a `switch` statement, you can use multiple ____ values to refer to the same set of statements.
   a. `boolean`
   b. `default`
   c. `break`
   d. `case`

9. With ____, the program includes code to check for improper data before an attempt is made to process it further.
   a. defensive programming
   b. bug tracking
   c. debugging
   d. self-cleaning

10. Checking user input data for erroneous or unreasonable data is referred to as ____.
    a. relational data validation
    b. arithmetic data validation
    c. output data validation
    d. input data validation

11. When the ++ operator appears before a variable it's called a(n) ____ increment operator.
    a. suffix
    b. infix
    c. postfix
    d. prefix

12. When diagrams are used to describe the algorithm, the description is referred to as ____.
    a. pseudocode
    b. a flowchart
    c. a formula
    d. a program

13. Writing of an algorithm by using computer-language statements is called ____ the algorithm.
    a. testing
    b. designing
    c. coding
    d. developing

14. To control the format of numbers displayed by `cout`, you can include field width ____ in an output stream.
    a. separators
    b. manipulators
    c. dividers
    d. escape sequences

15. The stream manipulator ____ sets the floating-point precision to `n` places.
    a. `setprecision(n)`
    b. `setw(n)`
    c. `setfill('x')`
    d. `showbase`

16. The stream manipulator ____ displays Boolean values as `true` and `false` rather than `1` and `0`.
    a. `booltext`
    b. `bool`
    c. `boolalpha`
    d. `showbool`

17. When a manipulator requiring an argument is used, the ____ header file must be included as part of the program.
    a. `istream`
    b. `ostream`
    c. `iostream`
    d. `iomanip`

18. Visual Basic, C, C++, and Java are all examples of ____ languages.
    a. assembly
    b. machine-level
    c. low-level
    d. high-level

19. When all statements in a high-level source program are translated as a complete unit before any statement is executed, the programming language is called a(n) ____ language.
    a. interpreted
    b. assembled
    c. compiled
    d. translated

20. The ____ statement is used to enter data in a program while it's running.
    a. `input`
    b. `data`
    c. `cout`
    d. `cin`

21. In addition to classifying programming languages as high or low level, they are also classified by orientation as either ____ or object-oriented.
    a. linked
    b. procedural
    c. interpreted
    d. compiled

22. The declaration statement for a function is referred to as a function ____.
    a. prototype
    b. calling
    c. definition
    d. initialization

23. The first procedural language was ____.
    a. FORTRAN
    b. COBOL
    c. Pascal
    d. C++

24. Every C++ function consists of two parts, a function header and a function ____.
    a. prototype
    b. definition
    c. body
    d. declaration

25. C++ provides the capability of using the same function name for more than one function, referred to as function ____.
    a. prototyping
    b. conditioning
    c. interpreting
    d. overloading

26. The ____ statement in C++ is used to implement a decision structure in its simplest form—choosing between two alternatives.
    a. `for`
    b. `if-else`
    c. `switch-case`
    d. `while`

27. A ____ relational expression consists of a relational operator that compares two operands.
    a. single
    b. complex
    c. composed
    d. simple

28. The most commonly used ____ in `if` statements are simple relational expressions.
    a. conditions
    b. comments
    c. evaluations
    d. branches

29. In a relational expression, the value of the expression can be only the integer value 1 or ____.
    a. -10
    b. -1
    c. 0
    d. 10

30. In C++, when comparing character data, the `char` values are coerced to ____ values automatically for the comparison.
    a. `bool`
    b. `unsigned int`
    c. `long`
    d. `int`

31. In C++, two string expressions can be compared by using relational operators or the ____ class's comparison methods.
    a. `string`
    b. `boolean`
    c. `object`
    d. `compareTo`

32. Logical operators AND, OR, and NOT are represented by the symbols `&&`, ____, and !, respectively.
    a. `>>`
    b. `||`
    c. `<<`
    d. `|`

33. In C++, the logical ____ operator is used to change an expression to its opposite state.
    a. AND
    b. OR
    c. NOT
    d. REVERSE

34. Using the `abs()` function requires including the ____ header file.
    a. `cnumber`
    b. `iostream`
    c. `math`
    d. `cmath`

35. The relational operator ____ is used to represent the condition "less than."
    a. `>`
    b. `<`
    c. `<=`
    d. `<<`

36. A ____ statement is a sequence of single statements contained between braces.
    a. compound
    b. single
    c. simple
    d. complex

37. The area in a program where a variable can be used is formally referred to as the ____ of the variable.
    a. spread
    b. block
    c. reach
    d. scope

38. A useful modification of the `if-else` statement involves omitting the ____ part of the statement.
    a. `expression`
    b. `endif`
    c. `else`
    d. `if`

39. A(n) ____ is any combination of operands and operators that yields a result.
    a. command
    b. expression
    c. sentence
    d. statement

40. In C++, Boolean variables are declared with the ____ keyword.
    a. `boolean`
    b. `false`
    c. `bool`
    d. `true`

41. ____ is a self-contained set of instructions used to operate a computer to produce a specific result.
    a. programming language
    b. computer program
    c. machine programming technique
    d. programming technique

42. A(n) ____ statement is the most basic C++ statement for assigning values to variables and performing computations.
    a. initialization
    b. assignment
    c. declaration
    d. arithmetic

43. In C++, the ____ symbol is called the assignment operator.
    a. `->`
    b. `>>`
    c. `==`
    d. `=`

44. Because of ____, the value assigned to the variable on the left side of the assignment operator is forced into the data type of the variable to which it's assigned.
    a. right-to-left associability
    b. left-to-right associability
    c. coercion
    d. operator precedence

45. ____ defines the order in which the program executes instructions.
    a. Iteration
    b. Invocation
    c. Sequence
    d. Selection

46. The purpose of ____ is to verify that a program works correctly and actually fulfills its requirements.
    a. testing
    b. coding
    c. analyzing
    d. designing

47. ____, also referred to as "looping" and "repetition," makes it possible to repeat the same operation based on the value of a condition.
    a. Selection
    b. Invocation
    c. Sequence
    d. Iteration

48. Applying a postfix or prefix ++ operator to a variable of type `bool` sets the Boolean value to ____.
    a. `false`
    b. `true`
    c. `yes`
    d. `correct`

49. Including one or more `if` statements inside an existing `if` statement is called a ____ `if` statement.
    a. composed
    b. complex
    c. compound
    d. nested

50. A(n) ____ chain is used in programming applications where one set of instructions must be selected from many possible alternatives.
    a. `break`
    b. `case`
    c. `for`
    d. `if-else`

SECTION B
ANSWER ALL QUESTIONS IN THIS SECTION.

51. Assume that a new fruit juice vending machine has been purchased for the Central Cafeteria of the University of Ghana, but it is not working properly. The machine sells the following types of juices: orange, apple, mango, and ginger–banana. A juice machine has two main components: a built-in cash register and several dispensers to hold and release the products.

Dispenser: The dispenser releases the selected item if it is not empty. It should show the number of items in the dispenser and the cost of the item.

The following *class dispenserType* defines the properties of a dispenser.

```
class dispenserType
{
public:
int getNoOfItems() const;
//Function to show the number of items in the machine.
//Postcondition: The value of numberOfItems is returned.
int getCost() const;
//Function to show the cost of the item.
//Postcondition: The value of cost is returned.
void makeSale();
//Function to reduce the number of items by 1.
//Postcondition: numberOfItems--;
dispenserType(int setNoOfItems = 50, int setCost = 50);
//Constructor
//Sets the cost and number of items in the dispenser
//to the values specified by the user.
//Postcondition: numberOfItems = setNoOfItems;
// cost = setCost;
// If no value is specified for a parameter, then its default value is
// assigned to the corresponding member variable.
private:
int numberOfItems; //variable to store the number of
//items in the dispenser
```

```
int cost; //variable to store the cost of an item
};
```

Cash Register: The register has some cash on hand, it accepts the amount from the customer, and if the amount deposited is more than the cost of the item, then—if possible—it returns the change. For simplicity, assume that the user deposits the money greater than or equal to the cost of the product. The cash register should also be able to show to the juice machine's owner the amount of money in the register at any given time. The class definition of the cash register is given as follows:

```
class cashRegister
{
public:
int getCurrentBalance() const;
//Function to show the current amount in the cash
//register.
//Postcondition: The value of cashOnHand is returned.
void acceptAmount(int amountIn);
//Function to receive the amount deposited by
//the customer and update the amount in the register.
//Postcondition: cashOnHand = cashOnHand + amountIn;
cashRegister(int cashIn = 500);
//Constructor
//Sets the cash in the register to a specific amount.
//Postcondition: cashOnHand = cashIn;
// If no value is specified when the
// object is declared, the default value
// assigned to cashOnHand is 500.
private:
int cashOnHand; //variable to store the cash
//in the register
};
```

You have been asked to write a C++ program that uses classes *cashRegister* and *dispenserType* to implement this juice vending machine so that it can be put into operation. The program should do the following:

a. Show the customer the different products sold by the vending machine.

b. Let the customer make the selection.

c. Show the customer the cost of the item selected.

d. Accept money from the customer.

e. Release the item.

Input: The item selection and the cost of the item.

Output: The selected item.

[30 marks]

52. A car rental company needs to know the longest registered vehicles. The number plates of these vehicles give a clue as to when they were registered. The year of registration of a car is determined by the ending alphabet or the last two digits on the number plate. Example, a car with its number plate having Q as its last letter was registered before one with the last letter as T and a registration number with its last digits as 11 was registered earlier than a car with 13 as its last digits. All cars with numerical last digits were registered later than cars with last digits as alphabets. Create an array to hold the number plates of the cars and sorts them according to the year of registration, oldest cars first and then display the sorted list.

[20 marks]