



PAN AFRICA CHRISTIAN UNIVERSITY

BBIT, BSCIT, DICT

END-OF-TERM EXAMINATION

DEPARTMENT: COMPUTING & INFORMATION TECHNOLOGY

COURSE CODE: BIT204/BCIT204,DICT0125

CAMPUS: ROYSAMBU

COURSE TITLE: OBJECT-ORIENTED PROGRAMMING 1

EXAM DATE: WEDNESDAY, 31ST JULY 2024

TIME: START HOUR – END 11:15-14:00 HRS

INSTRUCTIONS

- This exam script has **TWO (2)** sections.
- Read all questions carefully before attempting.
- Answer All questions in Section **A** and any other three questions in Section **B**.
- None programmable calculators permitted
- Calculators on phones, tablets and computers are NOT permitted in Theory Papers

SECTION A (Answer ALL questions in this section)

QUESTION 1

Tech Innovations, a company specializing in home automation solutions, is developing a SmartHome Automation System. This system will allow users to control and monitor various home devices such as lights, thermostats, and security cameras through a mobile application. The system is being developed using Java, leveraging Object-Oriented Programming (OOP) principles to ensure modularity, reusability, and maintainability.

- a) Explain how any TWO principles of Object-Oriented Programming can be applied in developing the SmartHome Automation System **(2 Marks)**
- b) Describe the concept of a class and object concerning the SmartHome Automation System. **(2 Marks)**
- c) Describe a scenario where a **while** loop would be more appropriate than a **for** loop in the context of the SmartHome Automation System. **(2 Marks)**
- d) Write a simple Java program to define a class Device with attributes name and status (on/off). Include methods to turn the device on and off. **(4 Marks)**

SECTION B

(Answer any THREE (3) questions in this section)

QUESTION 2

Study the program below to answer the questions that follow:

```
1. public class JavaBasics {
2.     public static void main(String[] args) {
3.         int[] numbers = {1, 2, 3, 4, 5};
4.         for (int num : numbers) {
5.             System.out.println("Number: " + num);
6.         }
7.         int factorialOf = 5;
8.         int result = calculateFactorial(factorialOf);
9.         System.out.println("Factorial of " + factorialOf + " is " + result);
10.        int sum = calculateSum(numbers);
11.        System.out.println("Sum of array elements: " + sum);
12.    }
13.    public static int calculateFactorial(int n) {
14.        int factorial = 1;
15.        for (int i = 1; i <= n; i++) {
16.            factorial *= i;
17.        }
18.        return factorial;
19.    }
20. }
```

```
14.}  
15.return factorial;  
16.}  
17.public static int calculateSum(int[] arr) {  
18.int sum = 0;  
19.for (int num : arr) {  
    sum += num;  
20.}  
21.return sum;  
22.}  
23.}
```

a) Explain how the loop used to print each number in the array 'numbers' works. **(2 marks)**

b) Describe the purpose of the '**calculateFactorial**' method **(2 marks)**

c) Justify the output of the calculateFactorial method if the input is 0. **(2 marks)**

d) Explain the significance of the keyword static in the methods '**calculateFactorial**' and '**calculateSum**'. **(2 marks)**

e) Modify the '**calculateSum**' method to return the average of the array elements instead of the sum. **(2 marks)**

QUESTION 3

a) Explain TWO importance for graphical user interface knowledge to object-oriented programmers **(4 marks)**

b) You have been approached to write a simple program to determine whether a potential client in an entertainment joint is underage or an adult and give appropriate advice. Write down the probable code that you would provide using conditional control structures. **(6 Marks)**

QUESTION 4

Study the program below to answer the questions that follow:

```
1. class Animal {  
2. String name;  
3. Animal(String name) {  
4. this.name = name;  
5. }  
6. void makeSound() {  
7. System.out.println("Animal makes a sound");  
8. }
```

```
9. void eat() {
10. System.out.println(name + " is eating");
11. }
12. }
13. class Dog extends Animal {
14. Dog(String name) {
15. super(name);
16. }
17. void makeSound() {
18. System.out.println(name + " barks");
19. }
20. void fetch() {
21. System.out.println(name + " is fetching");
22. }
23. }
24. class Cat extends Animal {
25. Cat(String name) {
26. super(name);
27. }
28. void makeSound() {
29. System.out.println(name + " meows");
30. }
31. void climb() {
32. System.out.println(name + " is climbing");
33. }
34. }
35. class AnimalTester {
36. public static void main(String[] args) {
37. Animal myAnimal = new Animal("Generic Animal");
38. myAnimal.makeSound();
39. myAnimal.eat();
40. Dog myDog = new Dog("Rex");
41. myDog.makeSound();
42. myDog.eat();
43. myDog.fetch();
44. Cat myCat = new Cat("Whiskers");
45. myCat.makeSound();
46. myCat.eat();
47. myCat.climb();
48. makeAnimalSound(myAnimal);
49. makeAnimalSound(myDog);
50. makeAnimalSound(myCat);
51. }
52. public static void makeAnimalSound(Animal animal) {
53. animal.makeSound();
54. }
```

```
55. public static void makeAnimalSound(Dog dog) {  
56. dog.makeSound();  
57. dog.fetch();  
58. }  
59. public static void makeAnimalSound(Cat cat) {  
60. cat.makeSound();  
61. cat.climb();  
62. }  
63. }
```

- a) Explain the purpose of the 'Animal' class, clearly indicating the properties and methods it defines. **(3 Marks)**
- b) Describe how inheritance is implemented in the provided code, clearly showing the classes involved. **(4 Marks)**
- c) Explain what would happen if the '**makeSound**' method in the '**Animal**' class were not overridden in the Dog and Cat classes. **(3 Marks)**

QUESTION 5

- a) Using for loop control structure, write a Java program to display "**God is good**" five times **(4 Marks)**
- b) Explain THREE reasons for the use of access specifiers in the following code snippet **(6 marks)**
- ```
1. class Hello{
2. protected int data=40;
3. private void msg(){System.out.println("Hello java");
4. }
5. }
6. public class Hard
7. {
8. public static void main(String args[])
9. {
10. A obj=new Hello();
11. System.out.println(obj.data);
12. obj.msg();
13. }
14. }
```

### QUESTION 6

- a) Describe your understanding of the term array and provide a code snippet on how to declare and initialize an array of three integers **(5 marks)**
- b) Write a Java program that creates an array of Thermostat objects and sets different temperatures for each thermostat using a loop. **(5 marks)**

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