

## 14. IMPORTING C++ PROGRAMS IN PYTHON

### Section – A

#### Choose the best answer

(1 Mark)

1. Which of the following is not a scripting language?  
(A) JavaScript                      (B) PHP                      (C) Perl                      **(D) HTML**
2. Importing C++ program in a Python program is called  
**(A) wrapping**                      (B) Downloading      (C) Interconnecting      (D) Parsing
3. The expansion of API is  
(A) Application Programming Interpreter                      **(B) Application Programming Interface**  
(C) Application Performing Interface                      (D) Application Programming Interlink
4. A framework for interfacing Python and C++ is  
(A) Ctypes                      (B) SWIG                      (C) Cython                      **(D) Boost**
5. Which of the following is a software design technique to split your code into separate parts?  
(A) Object oriented Programming                      **(B) Modular programming**  
(C) Low Level Programming                      (D) Procedure oriented Programming
6. The module which allows you to interface with the Windows operating system is  
**(A) OS module**                      (B) sys module                      (C) csv module                      (D) getopt module
7. getopt() will return an empty array if there is no error in splitting strings to  
(A) argv variable                      (B) opt variable                      **(C)args variable**                      (D) ifile variable
8. Identify the function call statement in the following snippet.  
if \_\_name\_\_ == '\_\_main\_\_':  
main(sys.argv[1:])  
(A) main(sys.argv[1:])                      **(B) \_\_name\_\_**                      (C) \_\_main\_\_                      (D) argv
9. Which of the following can be used for processing text, numbers, images, and scientific data?  
(A) HTML                      (B) C                      (C) C++                      **(D) PYTHON**
10. What does \_\_name\_\_ contains ?  
(A) c++ filename                      (B) main() name                      **(C) python filename**                      (D) os module name

## **Section-B**

**Answer the following questions**

**(2 Marks)**

**1. What is the theoretical difference between Scripting language and other programming language?**

<b>Scripting Language</b>	<b>Programming Language</b>
A scripting language requires an interpreter.	A programming language requires a compiler.
A scripting language need not be compiled.	A programming languages needs to be compiled before running .
<b><u>Example:</u></b> JavaScript, VBScript, PHP, Perl, Python, Ruby, ASP and Tcl.	<b><u>Example:</u></b> C, C++, Java, C# etc.

**2. Differentiate compiler and interpreter.**

<b>Compiler</b>	<b>Interpreter</b>
Compiler generates an Intermediate Code.	Interpreter generates Machine Code.
Compiler reads entire program for compilation.	Interpreter reads single statement at a time for interpretation.
Error deduction is difficult	Error deduction is easy
Comparatively faster	Slower
<b><u>Example:</u></b> gcc, g++, Borland TurboC	<b><u>Example:</u></b> Python, Basic, Java

**3. Write the expansion of (i) SWIG (ii) MinGW**

**SWIG** - Simplified Wrapper Interface Generator - Both C and C++

**MinGW** - Minimalist GNU for Windows

**4. What is the use of modules?**

- Modules are used to break down large programs into small manageable and organized files.
- Modules provide reusability of code.
- We can define our most used functions in a module and import it, instead of copying their definitions into different programs.

**5. What is the use of cd command. Give an example.**

- **Syntax:** cd <absolute path>

- “**cd**” command used to change directory and absolute path refers to the complete path where Python is installed.
- **Example:** c:\>cd c:\ program files \ openoffice 4 \ program

### Section-C

**Answer the following questions**

**(3 Marks)**

#### **1. Differentiate PYTHON and C++.**

<b>PYTHON</b>	<b>C++</b>
• Python is typically an "interpreted" language	• C++ is typically a "compiled" language
• Python is a dynamic-typed language	• C++ is compiled statically typed language
• Data type is not required while declaring variable	• Data type is required while declaring variable
• It can act both as scripting and general purpose language	• It is a general purpose language

#### **2. What are the applications of scripting language?**

- To automate certain tasks in a program
- Extracting information from a data set
- Less code intensive as compared to traditional programming language
- can bring new functions to applications and glue complex systems together

#### **3. What is MinGW? What is its use?**

- MinGW refers to a set of runtime header files.
- It is used in compiling and linking the code of C, C++ and FORTRAN to be run on Windows Operating System.
- MinGW allows to compile and execute C++ program dynamically through Python program using g++.

#### **4. Identify the module ,operator, definition name for the following:      welcome.display()**

**Welcome**      →      Module name  
**.**                →      Dot operator  
**display()**      →      Function call

## 5. What is sys.argv? What does it contain?

- **sys.argv** is the list of command-line arguments passed to the Python program.
- **argv** contains all the items that come along via the command-line input, it's basically an array holding the command-line arguments of the program.
- To use **sys.argv**, you will first have to import **sys**.
- **sys.argv[0]** is always the name of the program as it was invoked.
- **sys.argv[1]** is the first argument you pass to the program.
- **main(sys.argv[1])** :
  - Accepts the program file (Python program) and the input file (C++ file) as a list(array).
  - **argv[0]** contains the Python program which is need not to be passed because by default `__main__` contains source code reference
  - **argv[1]** contains the name of the C++ file which is to be processed.

### Section - D

#### Answer the following questions:

(5 Marks)

#### 1. Write any 5 features of Python.

- Python uses Automatic Garbage Collection.
- Python is a dynamically typed language.
- Python runs through an interpreter.
- Python code tends to be 5 to 10 times shorter than that written in C++.
- In Python, there is no need to declare types explicitly.
- In Python, a function may accept an argument of any type, and return multiple values without any kind of declaration beforehand.

#### 2. Explain each word of the following command.

**COMMAND:**      **Python <filename.py> -<i> <C++ filename without cpp extension>**

Where ,

<b>Python</b>	Keyword to execute the Python program from command-line
<b>&lt;filename.py &gt;</b>	Name of the Python program to executed
<b>-&lt; i &gt;</b>	Input mode
<b>&lt;C++ filename without cpp extension&gt;</b>	Name of C++ file to be compiled and executed

### 3. What is the purpose of sys,os,getopt module in Python. Explain

#### (i) Python's sys Module:

- This module provides access to some variables used by the interpreter and to functions that interact strongly with the interpreter.
- **sys.argv** is the list of command-line arguments passed to the Python program.
- **argv** contains all the items that come along via the command-line input, it's basically an array holding the command-line arguments of the program.
- To use **sys.argv**, you will first have to import sys.
- **sys.argv[0]** is always the name of the program as it was invoked.
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  - Accepts the program file (Python program) and the input file (C++ file) as a list(array).
  - **argv[0]** contains the Python program which is need not to be passed because by default `__main__` contains source code reference
  - **argv[1]** contains the name of the C++ file which is to be processed.

#### (ii) Python's OS Module:

- The OS module in Python provides a way of using operating system dependent functionality.
- The functions that the OS module allows you to interface with the Windows operating system where Python is running on.
- **os.system()**: Execute the C++ compiling command in the shell.
- For Example to compile C++ program g++ compiler should be invoked.
- **Command:** `os.system ('g++' + <variable_name1> '-<mode>' + <variable_name2>)`

• <b>os.system</b>	• function system() defined in os module
• <b>g++</b>	• General compiler to compile C++ program under Windows Operating system.
• <b>variable_name1</b>	• Name of the C++ file without extension .cpp in string format
• <b>mode</b>	• To specify input or output mode. Here it is o prefixed with hyphen.

- **Example:**

```
os.system('g++ ' + cpp_file + ' -o ' + exe_file)    --
```

g++ compiler compiles the file cpp\_file and -o (output) send to exe\_file

- **(iii) Python getopt Module:**

- The getopt module of Python helps you to parse (split) command-line options and arguments.
- This module provides two functions to enable command-line argument parsing.

- **getopt.getopt method:**

➤ This method parses command-line options and parameter list.

- **Syntax of getopt method:**

`<opts>,<args>=getopt.getopt(argv, options, [long_options])`

➤ Here is the detail of the parameters –

➤ **argv**                      -- This is the argument list of values to be parsed (splitted). In our program the complete command will be passed as a list.

➤ **options**                    -- This is string of option letters that the Python program recognize as, for input or for output, with options (like 'i' or 'o') that followed by a colon (:).

Here colon is used to denote the mode.

➤ **long\_options**      -- This parameter is passed with a list of strings. Argument of Long options should be followed by an equal sign ('=').

➤ In our program the C++ file name will be passed as string and 'i' also will be passed along with to indicate it as the input file.

- **getopt()** method returns value consisting of two elements.
- Each of these values are stored separately in two different list (arrays) **opts and args** .
- **Opts** contains list of splitted strings like mode, path and args contains any string if at all not splitted because of wrong path or mode.
- **args** will be an empty array if there is no error in splitting strings by getopt().

- **Example:**
- **opts, args = getopt.getopt (argv, 'i:', ['ifile='])**
  - where opts contains -- ('-i', 'c:\\pyprg\\p4')
  - -i: -- **option** nothing but **mode** should be followed by :
  - 'c:\\pyprg\\p4' -- **value** nothing but the **absolute path of C++ file**.
- In our examples since the entire command line commands are parsed and no leftover argument, the second argument args will be empty [].
- If args is displayed using print() command it displays the output as [].

- **Example:**

- >>>print(args)

- []

#### 4. Write the syntax for getopt() and explain its arguments and return values.

##### **Python getopt Module:**

- The **getopt** module of Python helps you to parse (split) command-line options and arguments.
- This module provides two functions to enable command-line argument parsing.
- **getopt.getopt method:**
  - This method parses command-line options and parameter list.
- **Syntax of getopt method:**

$$\langle \text{opts} \rangle, \langle \text{args} \rangle = \text{getopt.getopt}(\text{argv}, \text{options}, [\text{long\_options}])$$
  - Here is the detail of the parameters –
  - **argv** -- This is the argument list of values to be parsed (splited). In our program the complete command will be passed as a list.
  - **options** -- This is string of option letters that the Python program recognize as, for input or for output, with options (like 'i' or 'o') that followed by a colon (:). Here colon is used to denote the mode.
  - **long\_options** -- This parameter is passed with a list of strings. Argument of Long options should be followed by an equal sign ('=').
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- **Example:**
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## 5. Write a Python program to execute the following c++ coding.

### **C++ CODE:**

```
#include <iostream>
using namespace std;
int main()
{ cout<<"WELCOME";
return(0);
}
```

The above C++ program is saved in a file welcome.cpp

### **PYTHON PROGRAM:**

```
import sys, os, getopt
def main(argv):
    cpp_file = "
    exe_file = "
    opts, args = getopt.getopt(argv, "i:",['ifile='])
    for o, a in opts:
        if o in ("-i", "--ifile"):
```



```
cpp_file = a + '.cpp'
exe_file = a + '.exe'
run(cpp_file, exe_file)
def run(cpp_file, exe_file):
    print("Compiling " + cpp_file)
    os.system('g++ ' + cpp_file + ' -o ' + exe_file)
    print("Running " + exe_file)
    print("-----")
    print
    os.system(exe_file)
    print
if __name__ == '__main__':    #program starts executing from here
    main(sys.argv[1:])
```

### **STEPS TO IMPORT CPP CODE INTO PYTHON CODE:**

- ❖ **Select File**→**New** in Notepad and type the above Python program.
- ❖ Save the File as **welcome.py**.
- ❖ Click the Run Terminal and open the command window
- ❖ Go to the folder of Python using cd command.
- ❖ Type the command: **Python c:\pyprg\welcome.py -i c:\pyprg\welcome\_cpp**

### **OUTPUT:**

```
-----
WELCOME
-----
```

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