INSTRUCTIONS TO CANDIDATES

1. This paper consists of THREE sections.

2. Answer ALL questions.
SECTION A
MODULE 1: SOFTWARE AND SYSTEM DEVELOPMENT

Answer ALL questions in this section.

1. A structured software development process is typically employed to engineer a software product and avoid many development problems.

(a) Explain what is a software development process. [2 marks]

(b) Briefly discuss THREE reasons why there is a need to employ a software development process rather than the ad hoc approaches used in the past. [6 marks]

(c) Explain why testing is an important activity in any software development process. [2 marks]

Total 10 marks

2. A certain organization is about to develop a software product and is presently contemplating whether to use the waterfall model or evolutionary development.

(a) Outline the activities that would take place if the waterfall model is employed. [5 marks]

(b) State THREE activities that would take place if the evolutionary approach is used to develop the software. [3 marks]

(c) Briefly discuss ONE advantage of evolutionary development over the waterfall model. [2 marks]

Total 10 marks

3. During the analysis phase of the development of a software product, requirements are obtained and documented.

(a) Briefly describe TWO techniques that can be used to obtain the requirements, and state ONE advantage of EACH technique. [6 marks]

(b) Giving ONE example, explain the meaning of a functional requirement. [3 marks]

(c) Give ONE example of a non-functional requirement. [1 mark]

Total 10 marks
4. (a) Draw THREE of the symbols used in a data flow diagram and say why EACH is used. [6 marks]

(b) Distinguish between a data dictionary and an entity-relationship diagram. [4 marks]

Total 10 marks

5. (a) CASE tools are normally employed in the development of a software product.

(i) What is a CASE tool? [2 marks]

(ii) Briefly discuss how a CASE tool can be used during the analysis and design of a software product. [4 marks]

(b) A feasibility study is usually conducted during the analysis phase of the development of a software product.

(i) Explain why a feasibility study is undertaken. [2 marks]

(ii) Briefly describe what a feasibility report should contain. [2 marks]

Total 10 marks
SECTION B

MODULE 2: PROGRAMMING LANGUAGES

Answer ALL questions in this section.

6. Jones successfully completed CAPE Computer Science obtaining a Grade I. A company awarded him a contract to develop a computer program to maintain employee records using a procedural programming language.

(a) Describe the first THREE steps Jones must take in formulating the program. [6 marks]

(b) State FOUR ways in which the design approach would have been different if Jones had been required to use an object-oriented language instead. [4 marks]

Total 10 marks

7. (a) Describe, with examples, TWO programming constructs. [6 marks]

(b) Distinguish between 1st generation and 4th generation programming languages. [4 marks]

Total 10 marks

8. (a) Explain the following terms as they relate to the object-oriented paradigm.

   (i) Object

   (ii) Class [4 marks]

(b) Write an algorithm that uses bounded iteration to find the sum of all multiples of 4 between 4 and 100 (inclusive). [6 marks]

Total 10 marks
9. The two finalists in a beauty contest are Miss Barbados and Miss Cuba. The organizers of the competition have asked viewers to vote via the Internet for one of the contestants to be awarded the "Viewers' Choice" prize. A viewer votes by specifying the country to which the delegate belongs. Only the first 100 viewers' votes will be processed.

Assuming that all votes are valid and that there is no tie, write an algorithm to read the votes and print the country of the winning delegate together with the number of votes she obtained.

Total 10 marks

10. (a) Discuss TWO factors that one should consider when deciding which programming language should be used for writing an application. [6 marks]

(b) Recursion is a useful concept in programming. Briefly explain how recursion works. [2 marks]

(c) Explain what is meant by structured programming. [2 marks]

Total 10 marks

SECTION C

MODULE 3: PROGRAM DEVELOPMENT

Answer ALL questions in this section.

11. A company has a set of sales personnel data stored in a computer. A graphical user interface (GUI) program in an event driven environment is needed to access the sales data. The program should handle queries like the following:

What is the total number of items sold by salesperson James for the month of January 2007?

Draw a window that contains FOUR graphical user interface objects that can be used on the user interface for handling queries similar to the one above. State the purpose of EACH graphical user interface object drawn.

Total 10 marks
12. A stack \( stk \) is loaded with an unknown number of integers. Assume that the normal operations on a stack e.g., \( \text{push()} \) are already defined.

Write an algorithm that has the following functionality:

(a) Removes the elements of \( stk \) one by one and puts them in another data structure. Identify the data structure used and assume the typical operations on that data structure are available e.g., \( \text{isEmpty()} \).

(b) Counts the number of elements removed from \( stk \).

(c) Places the count calculated in 12 (b) above in \( stk \), followed by the original elements in the same order.

Example:

<table>
<thead>
<tr>
<th>Stk before algorithm executed</th>
<th>Stk after algorithm executed</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>

Total 10 marks
13. An $MPhone$ object is used to model a mobile phone (cellular). Each $MPhone$ object has THREE instance variables:

- $modelNum$ (a string representing the model of the $MPhone$)
- $regName$ (a string representing the name of the person who is the registered owner of the $MPhone$)
- $phoneBalance$ (amount of money available for making calls on the $MPhone$)

In addition to an appropriate constructor, the $MPhone$ object contains the following methods:

- $setRegName$: accepts a parameter, $newName$ (a string value) and sets the $regName$ of the $MPhone$ object to $newName$
- $increaseBalance$: accepts a parameter $amount$ representing an amount of money, and increases $phoneBalance$ by $amount$.

Using an object-oriented programming language of your choice, write the code to define the $MPhone$ class.

Total 10 marks

14. (a) Testing is an important aspect of program implementation. Explain, using one example, the following types of testing:

(i) Unit testing

(ii) System testing

[4 marks]

(b) Describe TWO types of documentation normally produced for a new software application.

[4 marks]

(c) Why do many software companies require users to have a licence for their software?

[2 marks]

Total 10 marks

15. (a) You are typing up a computer program and eventually wish to test the program.

Describe THREE programming tools that can assist you in this process.

[6 marks]

(b) (i) What is an ADT (Abstract Data Type)?

[2 marks]

(ii) Give an example of an ADT and state TWO operations normally performed on that ADT.

[2 marks]

Total 10 marks

END OF TEST