**ROYAL CIVIL SERVICE COMMISSION**

**BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2014**

**EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for *IT 3 YEARS***

**Date :** 12 October 2014

**Total Marks :** 100

**Examination Time :**150 minutes (2.5 hours)

**Reading Time :**15 minutes (prior to examination time)

**GENERAL INSTRUCTIONS:**

1. Write your Roll Number clearly and correctly in the Answer Booklet.
2. The first 15 minutes is provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS, namely SECTION A and SECTION B**.   
   **SECTION A** has two parts: **Part I – 30** Multiple-Choice Questions of 1 Mark each

**Part II** – **4** Shot Answer Questions of 5 Marks each

All questions under SECTION A are COMPULSORY

**SECTION B** consists of two Case Studies. Choose only ONE case study and answer the questions under your choice (50 Marks).

1. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.
2. Begin each Section and Part in a fresh page of the Answer Booklet.
3. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
4. Use of any other paper including paper for rough work is not permitted.
5. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
6. This paper has **10** printed pages in all, including this Instruction Page.

**GOOD LUCK!**

**SECTION A PART I – Multiple Choice Questions (30 Marks)**

**Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31. (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.**

1. In which layer of TCP/IP model of the Internet, the SMTP and FTP resides?
   1. Application Layer
   2. Transport Layer
   3. Internet Layer
   4. Network Access Layer
2. Which of the following is NOT a text editor?
   1. Notepad++
   2. Vim
   3. Emacs
   4. Wordpad
3. Which of the following is NOT true about XML document? *Document is not indented*.

<mother>

<son>

<name>Dorji</name>

<age> 21 </age>

</son>

<daughter>

<name>Wangmo</name>

<age> 15 </age>

</daughter>

</mother>

* 1. mother is root element
  2. sonand daughter are at same level
  3. Dorji and Wangmo are sub-elements
  4. name and age are sub-elements

1. A device that forwards data packets from one network to another with intelligence is called a:  
   1. Bridge
   2. Switch
   3. Hub
   4. Gateway
2. Use of **indexes** in database design and development results into all of the following EXCEPT?
   1. They increase disk space requirements of the database
   2. They decrease performance of *Inserts*, *Updates* and *Deletes*
   3. They increase maintenance requirements of the database
   4. They decrease performance of the table scanning
3. Which OSI model layer and its encapsulation unit is NOT correct?
   1. Data Link Layer and **Frames**
   2. Network Layer and **Packets**
   3. Transport Layer and **Data**
   4. Physical Layer and **Bits**
4. Which of the following application and their common port used is NOT correct?
   1. FTP uses port 30
   2. http uses port 80
   3. SMTP uses port 25
   4. Telnet uses port 23

,

1. All of the following wireless standards are correctly matched with the maximum data transfer speeds it supports EXCEPT:
   1. 802.11b supports maximum of 11Mbps
   2. 802.11a supports maximum of 54Mbps
   3. 802.11g supports maximum of 100Mbps
   4. 802.11n supports maximum of 300Mbps
2. A single transistor can be used to build which of the following digital logic gates?
   1. NOT gate
   2. OR gate
   3. AND gate
   4. NAND gate
3. In C/C++ data types, which of the following does not match the storage size:
   1. int - 2 byte
   2. char - 6 byte
   3. double - 8 byte
   4. float - 4 byte
4. In C programming, what does **malloc()** do?
   1. Dynamically allocates the memory of specified size
   2. Releases specified block of memory back to the system
   3. Initializes all bytes of allocated memory to zero
   4. Checks for memory allocation failure
5. In Java programming, which is **NOT** primitive data types:
   1. int,
   2. boolean
   3. double
   4. string
6. What does **final** keyword mean in programming?
   1. The value cannot be changed at runtime
   2. The maximum limit is assigned for the value
   3. The value has been reserved for system’s use
   4. The common value is created by the system
7. All are TRUE for reference data types EXCEPT
   1. Size may not be known in advance
   2. Size may change with reassignment
   3. Store value alongside variable name
   4. Store address alongside variable name
8. Which relationship indicates existence of **Inheritance** in a programming concept?
   1. “**is-a**” relationship
   2. “**has-a**” relationship
   3. “**instance-of**” relationship
   4. All of the above
9. In DFD, which of following are 4 commonly used elements?
   1. Functions, Processes, Data stores, Data flows
   2. Relationships, Processes, Data flows, External Entities
   3. Processes, Data Stores, Data flows, Data content
   4. External entities, Processes, Data stores, Data flows
10. In the following C code, what is the output produced?

*//Code Segment*

*int first = 0, second = 1, next;*

*for (int i = 0; i<=5; i++){*

*if (i<=1){*

*next = i;*

*}*

*else{*

*next = first + second;*

*first = second;*

*second = next;*

*}*

*printf(“%d”, next);*

*}*

* 1. 0 1 2 3 4 5
  2. 0 1 1 2 3 5
  3. 0 1 2 3 5 8
  4. 0 2 4 6 8 10

1. The following function is an example of:

int foo(int n){

if (n = 0) return 0;

elsereturn (foo(n-1)+2);

}

* 1. Static function
  2. Recursive function
  3. Mathematical function
  4. Simple function

1. For the given IP address: 126.16.0.8, which portion indicates network ID and host ID?
   1. First 8 bits are network ID and following 24 bits are host ID
   2. First 16 bits are network ID and following 16 bits are host ID
   3. First 24 bits are network ID and following 8 bits are host ID
   4. Cannot be determined from given information
2. What is output of the following code:

char \*myptr = “CSCE 2014”;

printf(“[%c], [%s]\n”, \*myptr, myprt);

* 1. C, address of C
  2. CSCE 2014, CSCE 2014
  3. C, CSCE 2014
  4. C, \0

1. Given X -> Y and Y-> Z, which following statement is TRUE?
   1. Y -> X
   2. X -> Y
   3. Z -> X
   4. X -> Z
2. In java programming, what does **new** keyword in the constructor do?
   1. **new** declares a new variable
   2. **new** creates an object or instance of the class
   3. **new** allocates the memory for the variable
   4. **new** destroys unused variable of the class
3. In java programming, what does **accessor** method do?
   1. It initializes the object
   2. It changes the object’s state
   3. It creates new objects
   4. It returns information about the object’s state without changing it
4. Following UML diagram shows:

**A**

**B**

* 1. Composition
  2. Inheritance
  3. Aggregation
  4. Association

1. What is decimal representation of hex number: **BD9**?
   1. 2819
   2. 3033
   3. 3417
   4. 2515
2. Which layer of OSI Reference Model deals with flow control, end-to-end connections and reliability?
   1. Data Link Layer
   2. Network Layer
   3. Application Layer
   4. Transport Layer
3. What is the value of this postfix expression: **6 2 1 + \* 3 /**
   1. 1
   2. 2
   3. 3
   4. 6
4. Which of the following statement is **TRUE** about *Output* and *Outcome*of a project?
   1. *Output* is direct result and *Outcome* is indirect result
   2. *Output* is long term result and *Outcome* is short term result
   3. *Output* is not easily measurable and *Outcome* is easily measurable
   4. *Output* is achieved at the end of project and *Outcome* is achieved immediately
5. Three strategies used for negative risks identified for a project are:
   1. Mitigate, Transfer and Accept
   2. Avoid, Transfer and Mitigate
   3. Transfer, Avoid and Calculate
   4. Ignore, Mitigate and Transfer
6. Black-box testing is a:  
   1. Testing strategy that considers a functional design specification to design test cases without regard to the internal program structure
   2. Process of locating the fault, repairing the code and retesting the code
   3. Testing strategy that requires knowledge of the internal structure of a program to design test cases
   4. Test tool that records test inputs and outcomes and provides facilities for subsequent re-execution

**PART-II: Short Answer Questions (20 Marks)**

1. a. What does ACID stands for in database management system? (1 mark)

b. Explain each of the concepts briefly. (4 marks)

1. List three advantages and three limitations of Multithreading. (5 marks)
2. a) Define **constraints** in database? (1 mark)  
   b) List at least 4 constraints used in database design and explain them briefly (4 marks)
3. Provided with any natural number ‘n’, you are asked to write following TWO functions (in any programming language code) to compute the sum of given natural number. *Example, if n = 3, sum= 1+2+3 = 6*
   1. Write a **simple function** to compute the sum of natural numbers ‘n’ and return the sum. (2.5 marks)
   2. Write a **recursive function** to compute the same sum of natural numbers ‘n’ and return the sum. (2.5 marks)

**SECTION B**  
**Case Study**

**Choose either case 1 or Case 2 from this section. Each Case carries 50 marks. Mark for each sub-question is indicated in the brackets.**

**CASE 1**

Bhutan Postal Corporation of Bhutan is planning to develop an **Online Tracking System**, which is a database management system to manage and store package delivery information. The system would provide user-friendly interface for their staff to easily add, update and track all the packages they are delivering to different destinations around the world. The postal service providers around the world can also access the system (after proper login) to update the information on location of packages on the way.

The system will also provide interface to the customers to track the location of their packages. The system will reflect the familiar scenario of postal or courier services offered for the delivery of packages globally.

You are selected as database designer or system analyst to develop this system and provided with following information.

* Package has package number, package description and package location detail.
* A location detail is multi-attribute of a package and has sequence number, status, date, city, country and comments.
* Each package belongs to only one customer and a customer can send many packages or none.
* A customer has CID, name and address
* A package must be carried by one of the postal service providers (PSP). PSP has identification number, provider name, address and password to access the system.

1. In the context of above case studies,
   1. Explain the Entity Relationship Diagram and their key components in database design? (5 marks)
   2. Design a complete Entity-Relationship Diagram for the above database system (10 marks)
2. Provide Schema Design for tables to develop this database. (10 marks)
3. For system development,
   1. What do you understand by prototyping in the system development? (5 marks)
   2. Design a prototype screen (interface) for tracking a package by the customer (5 marks)
   3. Design a prototype screen (interface) for updating package location by the PSP. (5 marks)
4. Write SQL statements to create a package table and location table, based on your E-R diagram and table schema. Remember to reflect all the constraints including primary keys and foreign keys requirements. (5 x 2 = 10 marks)

**CASE 2**:

You are hired as Network Designer for a small private company called “XYZ Enterprises” to design their office network. The Chief of IT Department of the company provides you with the following information diagrammatically. Use the information to answer all of the following questions.

**Store**

* 3 users

**Main Office**

* Internet
* Printers
* Scanners
* 30 users

50 metres

150 metres

**Computer Lab**

* 20 computers
* 5 Printers

1. Design a suitable network topology such that resources like Internet, Printers and Scanners are shared between the Main Office and Store while the Computer Lab shares Internet from the Main Office but is on a different network. (10 marks)
2. List out all the network equipment required to implement the above designed network. (5 marks)
3. Draw a Logical Network Diagram for the above design with Class C IP schemes (The IP schemes may be proposed as a range for individual users/computers). (15 marks)
4. State reasons why the Computer Lab is best suited in a different network. (5 marks)
5. What is structured cabling? Briefly explain its 6 subsystems. (10 marks)
6. What are the activities you would do to secure the network in terms of hardware, software and policies from both external as well as internal threats? (5 marks)