ROYAL CIVIL SERVICE COMMISSION

BHUTAN CIVIL SERVICE EXAMINATIONS (BCSE) 2011
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for ICT
(FOUR YEARS)

DATE: 30 October 2011

TOTAL MARKS: 100

TIME: 2.5 HOURS (150 MINUTES)

READING TIME: 15 MINUTES

INSTRUCTIONS:

1. Write your Roll Number clearly on the answer booklet in the space provided.

2. The first 15 minutes are being provided to check the number of pages, printing errors, clarify doubts and read the instructions. You are **NOT PERMITTED TO WRITE** during this time.

3. Use either **Blue** or **Black** ink pen or ball point pen for the written part and **H.B. Pencils** for the sketches and drawings

4. **All ANSWERS** must be written on the **ANSWER BOOK** provided. Candidates are not allowed to write anything on the question paper.

5. All answers must be labeled with appropriate question numbers (Section, Question and sub-Question Numbers wherever applicable). **Unlabelled answers will not be assessed.**

6. This question booklet consists of **11 pages** (including this page). It is divided into two sections, namely **SECTION A** and **SECTION B.**

7. **SECTION A** carries fifty (50) marks and consists of two (2) parts. **Part I** and **Part II. Answer all questions in this section.**

   Part I consists of 30 multiple choices questions carrying one (1) mark each (30 marks).
   Part II consists of four (4) short-answer questions of five (5) marks each (20 marks).

8. **SECTION B** carries fifty (50) marks containing two (2) case studies. Choose and answer **ANY ONE** case study.

PART – A
(50 Marks)

All answers in this section must be written on the Answer Book provided.

SECTION – I (30 Marks):

Multiple Choices: Select the most appropriate answer. There is only one correct answer in the list. Answers that contain more than one selection will not be graded. Choose only **ONE** answer.

Mark the correct answer letter (**a,b,c or d**) against the Question number in your **Answer Book.**

Example:

Q. The following type of image is defined as a grid whose cells are filled with color.

A. bitmap
B. vector
C. printed
D. interactive

Answer: Q – A

1. C++ introduces a new kind of variable known as the reference variable. Which operator is used to create a reference variable:

A. ::
B. &
C. ||
D. $

2. The inline function is used when:

A. The function definition code is too long
B. The function definition code is too complicated
C. The code is small enough to be defined in one or two lines.
D. Functions are recursive

3. Which of the following statement is true regarding program memory segments?

A. consists of three segments: code, data and heap
B. consists of four segments: text, code, data and heap
C. consists of five segments: text, code, heap, bss and stack
D. consists of five segments: text, data, bss, heap and stack

4. Which of the following refers to the byte order used by a 4-byte word on x86 processors?

A. big endian
B. little endian
C. reverse order
D. HSB first

5. The type void was introduced in ANSI C. Two normal uses of void are:

1. **To specify the return type of a function when it is not returning any value.**
2. **To specify the return type of a function when it returns some value**
3. **To specify the return type of a function when it returns 1**
4. **To indicate an empty argument list to a function**

A. 1 & 3
B. 2 & 3
C. 1 & 2
D. 1 & 4

6. In database programming, which of the following is directly related to redundancy of data?

A. insertion anomaly
B. duplication of fields
C. incomplete transaction
D. failed update

7. What keyword in class specification helps to hide data?

A. Public
B. Private
C. Static
D. Void

8. A recursive foreign key is a :

A. References a relation
B. References a table
C. References its own relation
D. References a foreign key

9. Difference between flow-chart and data-flow diagram is :

A. There is no difference
B. Usage in high level design and low level design
C. Control flow and data flow
D. Used in application programs and system programs

10. Dimentional modeling in Data Mining refers to :

A. View and interrogate data
B. Define structures and store data
C. Retrieve information only
D. None of these

11. Runtime polymorphism can be achieved by :

A. virtual function and inheritance
B. Accessing virtual function through the object
C. The derived class
D. None of the above

12. The following loop in 'C' language :

```
int i = 0;
while ( i + + < 0 ) i − − ;
```

A. will terminate
B. will go into infinite loop
C. will give compilation error
D. will never be executed

13. Problems with waterfall model are:

1. Real projects rarely follow processes as this model proposes
2. It is often difficult for the customer
3. Working model is available only at the end
4. Developers are delayed unnecessarily

Which of the following is true :

A. 1 and 4 only
B. 2 and 3 only
C. 1, 2 and 3 only
D. All 1, 2, 3 and 4

14. A Relation R = {A,B,C,D,E,F} is given with following set of functional dependencies: F = {A→B, AD →C, B →F, A →E}. Which of the following is candidate key?

A. A
B. AC
C. AD
D. None of the above

15. Identify the incorrect statement:

A. The Internet evolved into phenomenally successful e-commerce engine
B. e-business is synonymous with e-commerce
C. The e-commerce model B2C did not begin with billboardware
D. The e-commerce model G2C began with billboardware

16. In a population of N graduates, 50% of the graduates have three majors, 30% of the graduates have two majors and the remaining graduates have one major. What is the probability that a randomly picked graduate possesses two majors?

A. 3/23
B. 6/23
C. 3/10
D. 3/5

17. The best known example of a PAN is :

A. Ethernet
B. FDDI
C. IEEE 802.3
D. Bluetooth

18. An error message generated by an interactive system should have :

A. always have an error code
B. display the list of mistakes done by the user
C. should not indicate right or wrong
D. logs of previous occurrences of the same mistake

19. What output is generated by the query: SELECT student_name FROM students WHERE class_name = (SELECT class_name FROM students WHERE math_marks = 100);

A. The list of names of students in a class with 100 marks in mathematics
B. The names of all students of all classes in which at least one student has 100 marks in mathematics
C. The names of all students in all classes having 100 marks in mathematics
D. The names and class of all students whose marks in mathematics is 100

20. The dual of the switching function F = x + yz is given by :

A. x + yz
B. x (y + z)
C. x' + y'z'
D. x'(y' + z')

21. A small program written by a user within a software application is called :

A. a widget
B. a macro
C. an applet
D. a servelet

22. Binary data in optical storage media are usually represented by which of the following physical forms:

A. Pits and lands
B. Rods and cones
C. Positive and negative polarities
D. Charged and uncharged capacitors

23. An example of a non-adaptive routing algorithm is :

A. Distance vector routing
B. Flooding
C. Selective flooding
D. Shortest path routing

24. Function overloading is a concept in which :

A. A function is used to implement multiple tasks at the same time.
B. A function is called repeatedly by another function.
C. A function provides common interface to user to carry out possibly different function in each call.
D. A function is computationally too expensive for the system to handle.

25. In 'clean room' software engineering:

A. Only eco-friendly hardware is used.
B. Only hired facilities are used for development.
C. Correctness of code is verified before testing.
D. Implementation is done only after ensuring correctness.

26. Which of the following statement is correct?

A. A relation in 3NF is always in BCNF
B. A relation in BCNF is always in 3NF
C. BCNF and 3NF are totally different
D. A relation in BCNF is in 2NF but not in 3NF

27. While designing the user interface, one should :

A. Use as many short cuts as possible
B. Use as many defaults as possible
C. Use as many visual layouts as possible
D. Reduce the demand on short-term memory

28. Which of the following correctly describes a static variable?

A. It cannot be initialized
B. It is initialized once at the time of execution and cannot be changed at run time
C. It retains its value during the life of the program
D. None of the above

29. Which of the following routing protocols require an autonomous system number?

A. OSPF
B. EIGRP
C. RIP version 2
D. BGP

30. Which of the following statement is true regarding Wireshark?

A. It is 3-D multi-player internet game
B. It is a network packet sniffer application
C. It is a firewall for wired networks
D. It is an open proxy server freely available for download

SECTION- II (20 MARKS)

SHORT ANSWERS

All answers must be written on the **Answer Book** provided. Use only **blue** and **black** pens (ballpoint or fountain) for writing answers. All sketches and diagrams must be in **HB pencil**.

1. What do you understand by the term Reverse engineering? (1 Mark)

Describe how a software application (30 Days - Trail version) maybe typically hacked into to be used for ever. (3 Marks)

Briefly state the relationship between phishing and identity theft? (1 mark)

2. With regard to client-server computing, what do you understand by the term: Middleware? (1 Mark)

Briefly describe the following classes of client-server applications? (4 Marks)

a. host-based processing
b. server-based processing
c. client-based processing
d. cooperative processing

3. What do you understand by the term DLL in programming? (1 Mark)

Briefly describe each of the following: (3 Marks)

a. the exports
b. the code and data
c. the import library

Which of the above components maybe built by using the *dlltool*? (1 Mark)

4. To which initial questions must the analyst gain answers in order to build an initial prototype of a system output? (1 Mark)

With regard to designing forms and reports, briefly describe the following terms: (4 marks)

a. lightweight graphics
b. usability
c. template-based HTML
d. highlighting information

PART – B
(50 Marks)

CASE STUDY

All answers in this section must be written on the Answer Booklet provided. Mark appropriate question numbers. Write answers with only blue/black ink/ballpoint pens. All diagrams and sketches must be done in HB pencils.

Answer ANY ONE (1) CASE Study. Each Case study carries 50 marks.

1. CASE STUDY: DRASINDRA TECHNOLOGIES PVT. LIMITED

In carrying out system analysis and design, the entity relationship modeling is used in the design phase. In this context, read through the following Case Study carefully then answer questions that follow.

Drasindra Technologies Pvt. Ltd. is a business entity specializing in supplying computers and electronic components. The success of their business depends on a rapid response to their customer's orders and they are considering the feasibility of updating their current computer system. As a matter of policy Drasindra Technologies have no outstanding orders. If parts cannot be delivered when ordered, the order/part order is cancelled and customers must reorder at a later date. Their ordering procedure is as follows:

Customers place orders by post/telephone/fax/mail. The orders are checked on receipt for the correct name, address and customer's order number. This is carried out using a VDU which queries the customer file to find the Customer's Number. If the order is from new customer, their name and address is added to the customer file and a new customer's number is allocated. As the items ordered are given over the telephone or read from the customer's order form, the stock file is queried to ascertain whether the correct amount of stock is available. If it is, then the item's part number and description are automatically entered into the order shown on the VDU, and the order is then accepted and the invoice is printed together with a delivery note. When the invoice is printed, the system automatically makes an entry in the sales ledger file under the customer's number. As there is only one invoice per order, due to the "no partial order" policy, the invoice number is the same as the order number. The delivery note then sent to the dispatch unit where the goods are picked and packed and the delivery notes are part of a multipart invoice set.

The invoice is sent to the customer by mail.

Required:

a. Create a Level 1 Logical Data Flow Diagram for the above scenario.
b. Create a Logical Data Structure (LDS)/Entity Relationship Diagram (ERD) for Drasindra Technologies Pvt. Limited.
c. List the attributes for the entities in (b) and show the attributes by underlining them.
d. Design database tables and populate with likely records.
e. Identify some reports that maybe required from the system and write sample SQL queries that will be deployed for one of the reports you have identified.

2. CASE STUDY: Choki Handicrafts Pvt. Limited.

Mr. Choki Dhendup, the CEO/Proprietor, Choki Handicrafts Pvt. Limited, has asked you to help him as he launches his company's first e-commerce Web site. In college, Choki was a business major with an artistic bent. He helped to pay his way through college by decorating sneakers, t-shirts and banners with his hand-painted traditional designs. His business grew through word of mouth and through his participation in crafts fairs. By the time he earned his degree, Choki was running a successful business from his hostel room.

He expanded his sales efforts to include crafts fairs in nearby towns. He hired two college students to work for him, and he convinced several city gift shops to stock samples of his merchandise. The gift shops were not an ideal retail outlet for his products, however. Most people who want to buy traditionally decorated clothing and gift items want to choose specific designs or have special designs created just for them. Customers also want to choose the specific materials and items on which the design is placed. One of Choki's expat customers suggested that he consider selling his products on the Web.

Realizing that the Web would give Choki Handicrafts a chance to reach a much wider audience and would allow customers to choose design-gift combinations, Choki began gathering information and developing estimates about his planned Web activity. He bought a digital camera and took several hundred pictures of clothes (both local and foreign), shoes, designs, and gift item-design combinations. He then hired a local Web designer to create sample pages for the Web site, including catalog pages that contained the digital images.

When the Web designer had completed a prototype of the site, Choki worked with the designer to calculate page sizes (including the images). The average page size was 2 MB. Choki and his employees then navigated the prototype site several hundred times to develop an estimate of how many pages an average visitor would download. They concluded that an average site visitor would visit 50 pages during each visit. Choki worked with the Web designer to develop estimates of activity they expect to occur on the web site during its first two years of operation. These estimates include:

- The database of Web page information (including the images) will require about 500 GB of disk space.
- The database management software itself will require about 100 GB of disk space.
- The shopping cart software will require about 2 GB of disk space.
- About 6000 customers will visit the site during the first month, and site traffic will grow about 20 percent each month during the first two years.
- The site should accommodate a peak traffic load of 1000 visitors at one time.

Choki wants to include features on the site that are similar to those found on competing sites (such as Amazon.com, eBay, etc.) Choki wants the site to provide a good experience for visitors. If the site is successful, it will generate sufficient revenue to allow an upgrade after two years. However, he does not want to spend more money than is necessary to get the site up and keep it running for the next two years.

Required:

a. Determine the features and capacities (RAM, disk storage, processor speed) that Choki should include in the web server computer he will need for his site. Recommend protection and security software packages such as anti-virus, anti-Malware, anti-Spam, etc. Summarize your

purchase recommendation in a one-page memorandum to Choki. You may include information of vendors (such as Apple, Dell, Hewlett Packard, Acer, Sun**,** etc**.**) in your memorandum.

b. Consider the advantages and disadvantages of each major operating system that Choki might use on the new Web server computer. In a one-page memorandum to Choki, make a specific recommendation and support it with facts and a logical argument. If you do not believe that one operating system is clearly superior for this application, explain why.

c. Consider the advantages and disadvantages of each major web server software package for accomplishing the goals that Choki has for this site. In a one-page memorandum to Choki, make a specific recommendation regarding which web server software package he should use. Provide an explanation that supports your recommendation.

********** END OF QUESTION PAPER **********