ROYAL CIVIL SERVICE COMMISSION

CIVIL SERVICE COMMON EXAMINATION (CSCE) 2009

EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for B. TECH. & B. ENGG.
(COMPUTER SCIENCE & ENGINEERING)

DATE: 8th NOVEMBER 2009

TOTAL MARKS: 100

TIME: 2.5 HOURS (150 MINUTES)

READING TIME: 15 MINUTES

INSTRUCTIONS:

1. **All ANSWERS** must be written on the **ANSWER BOOK** provided.

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

3. This paper is divided into two Sections. **Section – A** carries 50 marks and consists of 30 multiple choice questions of one mark each (30 marks) and 4 short-answer questions of 5 marks each (20 marks). **Answer all questions in this section**.

4. **Section – B** carries 50 marks containing two case studies. Choose and answer any **ONE** case study.

5. All questions in one section must be completed/answered before answering the other section. If you start with Section – B first, you must finish all parts/questions in this section before moving to Section – A and vice versa.

6. **This question paper consists of 10 (Ten) pages including this page. Check that you have the complete set.**

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

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. **(30 Marks)**

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

<u>Example:</u>

Q. Which country lies to the south of Bhutan?

    a.   Mongolia
    b.   China
    c.   **India**
    d.   Japan

Answer: Q – c

1. In C programming language, the result of evaluating !(1 && !(0 || 1)) is

    a.   True
    b.   False
    c.   AND
    d.   OR

2. The opposite of open source software is

    a.   Closed origin software
    b.   Open destination software
    c.   Proprietary software
    d.   None of the above

3. Which of the following is a browser

    a. Windows XP Professional
    b. Windows Vista Business
    c. Unix
    d. Internet Explorer

4. Which of the following statement is not true of static RAM (SRAM) and/or dynamic RAM (DRAM)

   a.   SRAM does not need to be periodically refreshed
   b.   In Pentium, capacity of both SRAM and DRAM are equal to its processor speed
   c.   DRAM refreshes the memory
   d.   Both consumes some power

5. Object-Oriented Programming (OOP) uses

   a.   HTML and SQL statements
   b.   Only C++ and Java as its programming languages
   c.   BEGIN and END to signal the beginning and end of a code block
   d.   Data structures that consist of data fields and methods together with their interactions

6. In Systems Development Life Cycle (SDLC), the correct sequence of methodology is

   a.   Design → Testing → Analysis → Implementation
   b.   Design → Implementation → Testing → Analysis
   c.   Analysis → Design → Implementation → Testing
   d.   Analysis → Design → Testing → Implementation

7. Which of the following was used as experimental Internet Protocol and never deployed?

   a.   IPv4
   b.   IPv5
   c.   IPv6
   d.   All of the above

8. Which OSI layer controls communication between hosts?

   a.   Session
   b.   Network
   c.   Data link
   d.   Physical

9. How many bytes does an IPv6 address contain?

   a.   4
   b.   8
   c.   16
   d.   32

10. The output of the following C++ program is:

```
#include <iostream.h>
void isfun(int *x)
{
x=new int;
*x=12;
}
int main()
{
int v=100;
isfun(&v);
cout<<v;
}
```

    a.   1.2
    b.   12
    c.   100
    d.   1200

11. The time T required to execute a program which determines the performance of a computer can be expressed as equal to:

    a.   (Number of instructions) x (1/clock rate) x (clocks per instruction)
    b.   Number of instructions x clock rate
    c.   1/clock rate
    d.   Clock rate

12. Which of the following pair of terms is not related?

    a.   Microcomputer and microprocessor
    b.   Microcomputer and Microcontroller
    c.   Microcontroller and microprocessor
    d.   Microprocessor and Microsoft

13. The protocol used to retrieve e-mail over a TCP/IP connection is:

    a.   Simple Mail Transfer Protocol
    b.   Internet Protocol
    c.   Post Office Protocol
    d.   Transmission Control Protocol

14. The current addressing architecture of IP addresses uses

   a.   Class A
   b.   Class B
   c.   Class C
   d.   Classless

15. Which of the following is used to connect computer to computer?

   a.   Unshielded twisted pair (UTP) CAT 5 straight cable
   b.   Unshielded twisted pair (UTP) CAT 5 crossover cable
   c.   50 ohm coaxial cable
   d.   Both (a) and (b)

16. On a webpage, which of the following source code can be viewed?

   a.   HTML
   b.   XML
   c.   SQL
   d.   Both (a) and (b)

17. In a Time-division multiplexing (TDM), samples leave from different sources during different time slots and are transmitted

   a.   Serially over a single communication channel
   b.   Serially over different communication channels
   c.   In parallel over a single communication channel
   d.   In parallel over different communication channels

18.   Which of the following is not true of an optical communication?

   a.   The wavelength of a single-mode fiber is greater than that of a multi-mode fiber
   b.   Optical signal is transmitted by using the principle of total internal reflection
   c.   The cladding of a fiber-optic cable does not absorb light from the core
   d.   The amount of information transmitted is inversely related to the bandwidth of the modulated carrier.

19. Which of the following IEEE standard is Wi-Fi based?

   a.   IEEE 802.1Q
   b.   IEEE 802.11
   c.   IEEE 802.15
   d.   IEEE 802.16

20. Which following condition must sorting algorithm satisfy?

    a.   The output is a reverse reordering of the input
    b.   The output is a random ordering of the input, but in a more human-readable form
    c.   The output is a permutation of the input in decreasing order
    d.   The output is in nondecreasing order

21. SQL is a database language not designed for

    a.   Data communication
    b.   Data query
    c.   Data update
    d.   Data access

22. The SQL statement **SELECT * FROM GRADUATES WHERE MARKS > 50;** will output

    a.   Only MARKS column
    b.   Only MARKS column with values greater than 50
    c.   All columns with rows in which the values in MARKS column are greater than 50
    d.   Error

23. In a Relational Database Management System (RDBMS), the relationship among the data is stored in

    a.   The form of tables
    b.   The form interlinked by hypertext
    c.   The form of database codes
    d.   None of the above

24. Which of the following is an example of open source program?

    a.   Internet Explorer
    b.   Microsoft Office
    c.   Windows XP
    d.   Mozilla Firefox

25. In the Unified Modeling Language (UML) standard, the diagram represents the following two different views of a system model:

    a.   Static and structural
    b.   Dynamic and behavioral
    c.   Static and dynamic
    d.   All of the above

26. If 192.168.1.0 is a /24 network address, what is its subnet mask?

    a.   255.255.255.0
    b.   255.255.255.128
    c.   255.255.255.192
    d.   255.255.255.224

27. Which of the following is true of Moore's Law?

    a.   The number of transistors that can be placed on an integrated circuit doubles every year
    b.   The number of transistors that can be placed on an integrated circuit doubles every one and half years
    c.   The number of transistors that can be placed on an integrated circuit doubles approximately every two years
    d.   The number of transistors that can be placed on an integrated circuit is directly proportional to the size of an integrated circuit

28. In a computer, a cache is a

    a.   Temporary storage space where frequently accessed data can be stored for rapid access
    b.   Storage on a hard disk where frequently accessed data are permanently written
    c.   Storage area where deleted items are temporarily stored until a computer shutdown
    d.   Storage area created by the Internet browser where cookies are stored

29. In computer networks, a proxy server that passes requests and replies unmodified is usually called a

    a.   Router
    b.   Gateway
    c.   Web server
    d.   FTP server

30. Electrical voltage used in Bhutan is

    a.   100 Volt
    b.   110 Volt
    c.   230 Volt
    d.   280 Volt

SHORT ANSWERS (20 MARKS)

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.

31.
    I.   How many layers does OSI model have?
    II.   Name all the OSI layers in order from bottom to top
    III.   Which OSI layer includes HTTP?
    IV.   At what OSI layer do routers operate?
    V.   Which layer receives service from the transport layer?

32.
    I.   Define analog signal and give an example
    II.   Define digital signal and give an example
    III.   What standard unit usually measures signal-to-noise ratio?
    IV.   Name 3 different types of data communication/transmission media
    IV.   What transmission media is used to build Thimphu WAN by DIT (MoIC)?
    V.   What does **modem** stand for? State its use

33.
A computer network (LAN) is assigned 192.168.1.0/24 IP address block. Without further sub-netting,
    I.   What is the network address of the LAN?
    II.   What is the broadcast address of the LAN?
    III.   What is the total number of available IP addresses?
    IV.   What is the total number of usable IP addresses?
    V.   What is its wildcard mask?

34.
    I.   What is Internet and what standardized protocol suite does it use?
    II.   What system on the Internet translates an IP address into human-readable name which can be easily remembered?
    III.   Give an example of a standard Uniform Resource Locator (URL)
    IV.   Which agent transfer the e-mail from one computer to another?
    V.   What is the maximum theoretical transfer speed offered by a dial-up modem?

PART – B
(50 Marks)

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 1 (one) Question. Each question carries 50 marks

1.   Community Information Center (CIC)

The job market in Bhutan is fast becoming a crowded space. Employment opportunities in the government and corporations are limited. You will be lucky to get any job, let alone your dream job. However, there is a silver lining to the graduates of ICT-related fields. The self-employment creation and prospects are higher in these fields than other professions. One such opportunity is the setting up of the Community Information Center (CIC) as your business.

CIC is the Community Information Center being set up to provide Information and Communication Technology (ICT) access to rural communities in Bhutan thus mitigating the digital divide. In Bhutan, Department of Information Technology (DIT) under the Ministry of Information and Communications (MoIC) plays a central role in determining and locating the setup. By the next year or two, DIT plans to have CIC in every gewog in Bhutan. But as an entrepreneur, you are not going to depend on them and wait. Instead you will propose to DIT the establishment, operation and maintenance of CIC in your gewog. Because there will likely be many applicants proposing the same, you will have to convince DIT and win this fund for the CIC project and launch it as your sustainable business. Assume there is no limit to the fund and that it will be granted based on your proposal.

To do so, prepare your **CIC Project** proposal based on the following questions:

1.1   (10 Marks)
      I.   What is the purpose of the project? You may list five different services CIC will provide as its purpose.
     II. State the current ICT situation in your gewog. Situation can be assumed and does not need to reflect the reality of your gewog.

1.2   (10 Marks)
      I.   What are the difficulties your gewog face which can be solved by CIC? List five.
     II. What are your anticipated challenges? List five.

1.3   (10 Marks)
      I.   Against each of the five difficulties your gewog face as in 1.2 (I) above, list ICT tool or system you will introduce to solve the problem.
     II. State one use each for the five tools or systems you introduced.

1.4   (10 Marks)
      I. What ICT infrastructure will you need to set up CIC? List five.
     II. Sketch/draw a small Local Area Network (LAN) you will set up at CIC connecting your infrastructure equipments. Label the equipments used.

1.5   (10 Marks)
      I. Present your budget requirements and implementation time schedule. In the budget, try to reflect the costs of buying equipments and availing services as close as possible to the reality in Bhutan. Round the cost of each item to the nearest hundred to make calculations simpler. Justify if you incur an abnormally very low or high cost. The implementation time schedule should also be reflective of the close reality in Bhutan.
           If you have to make any assumptions in the budget and/or schedule, list them.

     II. Present your CIC project as a sustainable business by listing an average day's 5 different income sources with their amount and the expected monthly total income. Since it is a startup business, assume you are the only employee in CIC. List the assumptions you make. Justifications can also be provided wherever needed.

OR

2.   **Entity-Relationship (E-R) Model for Bioinformatics Application**

Patient has: a unique MSP number, name, date of birth, tissue type and an indicator denoting whether the tissue is cancerous or normal.

A patient library associates a patient with multiple tags.

Each tag has a unique tag number and a unique nucleotide sequence.

For each tag in the patient library, a count is given to record the number of times the tag occurs in the library. In general, the same tag can be associated with any number of patients.

A tag may be mapped to a gene. Each gene has a unique gene name and a type.

In general, multiple tags may be mapped to the same gene. However, two different genes cannot be mapped to the same tag.

Finally, an article is identified by a unique article number and a journal name. An article may analyze multiple genes and a gene may be analyzed by multiple articles.

(Source: CPSC 304, 2004, University of British Columbia)

      I. List the entity sets and their corresponding attributes   (10 Marks)
     II. List the relationship sets   (5 Marks)
    III. Construct the E-R diagram for the Bioinformatics Application   (25 Marks)
    IV. Create tables for Patients, Tags, Genes, Articles and Maps. Underline the PRIMARY KEY. Use the table format like this: **CITIZENS(ID, Name, Village, …)**   (10 Marks)