ROYAL CIVIL SERVICE COMMISSION
CIVIL SERVICE COMMON EXAMINATION (CSCE) 2008
EXAMINATION CATEGORY: <u>TECHNICAL</u>

PAPER III: SUBJECT SPECIALIZATION PAPER for ICT (4 years)
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Date : 20/12/08
Total Marks : 100
Examination Time : 2.5 hours
Reading Time : 15 minutes
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INSTRUCTIONS:

1. **This paper consists of <u>9</u> pages. Check that you have the complete set.** There are two sections to this paper.

    Section A: includes 30 multiple-choice questions of one mark each and 4 short answer questions of 5 marks each. (50 marks)

    Section B: contains two case studies and candidates are required to attempt <u>only</u> one of them. (50 marks)

2. **All answers must be answered in the answer sheets provided**. Answers in question papers will **not** be considered.

3. Please read the questions carefully before answering them. Take note of negatives in each question for example "<u>not</u>".

4. Scientific calculators will not be required for this exam.

SECTION A
(50 Marks)

a) **Multiple-Choice questions:** Select your answer and fill it in the answer sheets provided along with the question number. Please ensure that the section is clearly identified in your answer sheet. For each question carefully read all the choices provided and select the most appropriate answer. (**30 Marks**)

1. Which of the following are examples of System software?
    a. Red Hat Linux and Open Office
    b. Windows 2003 and Debian Linux
    c. Windows XP and Excel
    d. Fedora and GIMP
2. Which of the following are critical steps in the waterfall methodology of software development?
    a. Deliver and Operation, Testing, Coding, Change Management
    b. Requirements Analysis, Design, Feedback, Prototyping
    c. Requirements Analysis, Design, Coding, Testing
    d. Analysis, Design, Prototyping, Change Management
3. Identify the list of important technological breakthroughs that lead to the success of the INTERNET.
    a. IP, TCP, UDP, Ethernet, Fibre Optics
    b. IP, UDP, WiFi, WiMax, Microwave
    c. IP, TCP, HTTP, SMTP
    d. IP, UDP, POP, SNMP
4. A computer that processes continuous information from devices is called
    a. a digital computer
    b. a micro computer
    c. a computer system
    d. an analog computer
5. A 1 MB computer storage area contains
    a. 1,000,000 bytes
    b. 1000, bytes
    c. 1,048,576 bytes
    d. 1,024 bytes
6. Multiple selection with repeated applications of IF … ELSE is
    a. Not a good problem-solving technique because the logic is too complicated to follow
    b. Useful in problem verification
    c. An alternative form of looping
    d. Sometimes called mutual exclusion

7. #include <stdio.h> means
    a. include a studio package for high-resolution graphics work
    b. include a file that enables input/output operations
    c. nothing, it is just required in all c programs
    d. the start of the source code of a c program
8. Select the language that does <u>not</u> follow Object Oriented programming paradigm.
    a. C
    b. Java
    c. C++
    d. Objective C
9. Memory that is <u>not</u> lost when a computer's power is turned off is:
    a. Main memory
    b. Primary storage
    c. ROM
    d. RAM
10. Select the Boolean equation that matches the circuit diagram in the Figure given below:
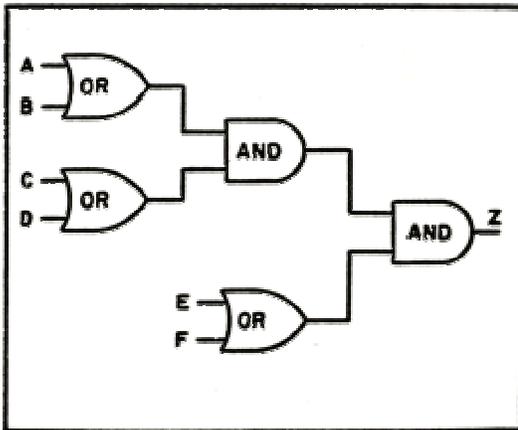
    a. Z = AB + CD + EF
    b. Z = (A+B)(C+D)(E+F)
    c. Z = A+B+C+D+EF
    d. Z = ABCD(E+F)

11. The "Tower of Hanoi" is a classical problem used in computer science. What concept in computer science is clearly demonstrated by this problem?
    a. Conditional looping
    b. Mutual exclusion
    c. Encapsulation
    d. Recursion

12. Which of the following is <u>not</u> an application of Client/Server Architecture?
   a. Bit Torrents
   b. Telnet
   c. POP
   d. HTTP

13. What is the output of the following program? (mod = modulo)

```
Main(){

    For(int i=0; i<20; i++){

        if((i mod 2) == 0) {

        print i;

        }

        print "x";

}
```

   a. xxxxxxxxxx2468101214161820
   b. x2x4x6x8x10x12x14x16x18x20
   c. 1x2x3x4x5x6x7x8x9x10x
   d. 1x3x5x7x9x11x13x15x17x19x

14. In satellite communications, _____ is the biggest challenge for real time communications
   a. Noise
   b. Bandwidth
   c. Latency
   d. Jitter

15. When designing databases "De-normalization" is considered only
   a. When weighing the advantages of redundancy for convenience
   b. When efficiency is paramount
   c. When normalization is not possible
   d. When the server has limited space

16. Which of these are <u>not</u> KEYWORDS in SQL
   a. NOT
   b. DISTINCT
   c. UNION
   d. EQUALS

17. *lock* in Databases are normally used for
   a. preventing Deadlocks
   b. Security
   c. Consistency
   d. Efficiency

18. OLAP is mainly used for
    a. Databases management
    b. Transactions in databases
    c. Querying the database
    d. Decision support systems
19. What is the output of the following C program?

Main(){

float f;

f = (int) (1 + 3.5);

f=f*2.5;

printf("%f", &f);

}

    a. 10
    b. 10.0
    c. 11.25
    d. 11
20. IPv6 addresses all the shortcomings of IPv4 except
    a. Limited address space
    b. Limited security
    c. Not optimal for voice and audio
    d. Lack of popularity
21. When computing routing tables which algorithm would you consider
    a. Divide and conquer algorithm
    b. Huffman coding algorithm
    c. Shortest Job Next algorithm
    d. Dijkstra's algorithm
22. Of the following layers, which layer is not part of the TCP/IP model
    a. Application
    b. Network Interface
    c. Transport
    d. Presentation
23. The protocol used to identify the physical address of computers within a LAN is called
    a. IP
    b. TCP
    c. ICMP
    d. ARP

24. IP addresses are divided into classes depending on the number of networks and hosts. Which of the following is not one of those classes
    a. A
    b. C
    c. E
    d. G
25. To optimally utilize the multiple cores in CPUs, programmers
    a. Run many programs at once
    b. Make system processes use some cores, and application processes use other cores
    c. Develop multithreaded programs
    d. Develop parallel programs
26. What is the value of the logical operation shown below?

X: 011010

Y: 001101   X v Y = ?

    a. 011111
    b. 011010
    c. 001000
    d. 001101
27. Which of the following is <u>not</u> an attack to compromise your system
    a. Buffer overflow
    b. SYN flood
    c. Distributed Denial of service
    d. SPAM
28. Auditing is a required factor to sustain and enforce what?
    a. Accountability
    b. Confidentiality
    c. Accessibility
    d. Redundancy
29. The biggest cause of scope creep in software development projects today is because
    a. Software development is difficult
    b. Software Project management is difficult
    c. Understanding and collecting user requirements is difficult
    d. System testing is difficult
30. Suppose a user turns on his/her computer, starts a web browser, types http://www.druknet.bt and hits enter. Which protocol would probably be the least used to serve this request?
    a. HTTP
    b. TCP
    c. UDP
    d. IP

b) Short answer questions: There are 4 short questions below. Please answer all the questions in the answer sheets provided. Be as succinct as possible. Clearly provide the question number next to each answer (**20 marks**)

1. What would the following "for loops" output?

```
for{int i=0; i<10; i++}{

    for{int j=1;j<=10;j++}{

    print (i+j);

    }

    print ('\n');

}
```

2. In E-Commerce define B2B, C2C, B2C, and B2G in your own words.
3. Name and define 5 fundamental OOP concepts
4. "Byzantine generals" problem is a classical concept used to demonstrate the difficulty of synchronization of distributed systems. While this problem cannot be solved, a practical solution can be devised to improve the chances of synchronization. Briefly describe how you would go about improving the chances of synchronization of two distributed systems.

SECTION B
(50 Marks)

From the given two case studies, choose one and attempt all the questions. Wherever necessary draw diagrams to illustrate your point (use a pencil for diagrams). Clearly indicate which case you are attempting.

Case 1: Database design - online Computer hardware approval system

An agency X, in the government, is in charge of all computer hardware purchases made by the government. The agency currently accepts only paper based application forms for approval of computer hardware. The agency normally takes 2 to 5 days to process the paperwork. This is a slow process and is very frustrating for government agencies that would like to get their approvals within 24 hours.

In order to improve service delivery Agency X decides to develop a web based online application system using a backend database to manage all its transactions. The following are its requirements:

1. The system should use broad categories for types of computers. For e.g. laptops, desktops, servers.
2. The system should allow users to select specifications for computers using dropdown menus that are populated from a master table in the database.
3. The system should maintain a list of technical users from the Agency who are authorized to approve and disapprove applications with unique usernames for accountability.
4. The system should maintain transactions of each application including details of approval, rejection, the agency that applied, approver, date, and reasons for approval or disapproval.
5. The head of the agency is the user who finally approves/disapproves each application depending on the reasons provided by the technical users

Q1. Draw a detailed Extended Entity-Relation diagram that captures all the above requirements (20 marks)

Q2. Draw a Data Flow Diagram describing how data will flow in the new web based system. (20 marks)

Q3. Briefly summarize how your system will improve the overall efficiency of agency X, and further how it will benefit the government as a whole. Keep in mind that this portion of your answer will be used to convince senior managers who may or may not be ICT savvy. (10 marks)

Case 2: Network – Design and implement a network for an Agency

An Agency Y has recently decided to implement a network in its office. The agency is physically separated into two buildings 1 and 2. Building 1 has 50 employees and building 2 has 75 employees all of who use computers. The agency would like to interconnect all of them on a single LAN to share resources like, file servers, printers and Internet, and also optimize user efficiency by implementing a computer based chat facility. In addition the Agency would like to host its own web server and maintain a uniform personnel email for all its employees.

In order to please the Agency the consultant hired to design the network must ensure the following requirements:

1. The design of the network should be as neat and effective as possible.
2. The design should clearly identify switches, routers, access points, firewalls, and also indicate DMZ and MZ wherever required.
3. The design should clearly define global IP addresses for servers that require them and indicate how private IP addresses will also be assigned.
4. Each server in the design should indicate the specifications required, including but not limited to; OS, other required System/Application software, and the ports used by each service.
5. In addition to the above the designer must fill in missing areas to ensure an effective and secure networked solution.

Q1. Draw a detailed network design diagram using standard conventions to address the above requirements. (20 marks)

Q2. Draft a security policy for the organization on the safe and secure use of the network. This should include the roles and responsibilities of users, administrators, and management. It should include access privileges for server rooms, and how overall confidentiality, integrity and availability should be maintained. (20 marks)

Q3. To ensure that the above network is secure, please draft the access control statements that maybe used in the firewall/s and router/s. (pseudo commands are acceptable). (10 marks)