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

PAPER III: SUBJECT SPECIALIZATION PAPER for ICT (3 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.

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. What is the most accurate sequence of activities in the software development life cycle?
    a. Planning – Design – Code – Test – Implement
    b. Analysis – Design – Code – Test – Implement
    c. Analysis – Design – code – Change Management – Implement
    d. Code – Prototype – Change Management – Code – Implement
2. Identify the output of the following program

```
Main( )
{
    int j =10
    for(int i =0; i<=j; ){
            switch(i){
            case 0: i+=2; break;
            case 1: i+=5; break;
            case 2: i+=8; break;
            default: i+=1;
                }
    printf("%d/%d,", i,j);
            }
}
```
    a. 0/10, 2/10,10/10
    b. 2/10,10/10
    c. 2/10,7/10,8/10,9/10,10/10
    d. Syntax error
3. Convert the binary number 1011010001001101110 to octal
    a. 1321156
    b. 1231156
    c. 3211564
    d. 5678391
4. Find the decimal representation of the octal number 375
    a. 255
    b. 128
    c. 256
    d. 253

5. Find the decimal representation of the binary number 1011
   a. 8
   b. 10
   c. 11
   d. 9
6. A disjunction requires all inputs to be true for the output to be true
   a. TRUE
   b. FALSE
7. The negation of an XOR gate is equivalent to a
   a. Bi-conditional gate.
   b. Conditional gate
   c. Disjunction
   d. NOT gate
8. NOT X OR NOT Y is equivalent to
   a. X AND Y
   b. X OR Y
   c. NOT X OR Y
   d. NOT X AND NOT Y
9. What does the following program do?

```
#include <stdio.h>
main ( )
{
    const float CUT_OFF = 30000;
    const float RATE = 0.1;
    float cost, x;

    printf("Enter value: ");
    scanf("%f", &cost);

    if(cost > CUT_OFF){
    x = (cost – CUT_OFF)*RATE;
    return x;
    }
    return 0;
}
```

   a. Takes a value from the user and returns the amount of tax that needs to be paid
   b. Takes a value from the user; deducts a constant value; and returns the tax amount on the remainder
   c. Takes a value and returns that value multiplied by the RATE
   d. Does nothing

10. Identify the output of the following program

Main ( ) {

    for(int i = 0; i < 5; i++) {
        switch(i)
        case o: printf("January,"); break;
        case 1: printf("February,"); break;
        case 2: printf("March,"); break;
        case 3: printf("April"); break;
        case 4: printf("May"); break;
        default: printf("Months");
        }
    }

      a. January, February, March,April,May,Months
      b. January,February,March,AprilMay
      c. January,February,March,April,May,June,July,August,September,October, November,December
      d. January,February,March,April,May

11. Identify the output of the following program

Main ( ) {
    int i = 10;
    while (i>=0) {
    printf(i);
    i = i mod 2;
    }
}
      a. 10,0
      b. 100000000000…………..
      c. 100
      d. 10000000

12. The statement for (x=0; x<=-1;x++) printf("x=0");
      a. Is an infinite loop
      b. Will never output
      c. Causes a syntax error
      d. Will output once

13. In computer science a stack is a good example for
      a. FIFO
      b. FILO
      c. LILO
      d. A book shelf

14. In computer science a queue is a good example for
    a. FIFO
    b. FILO
    c. LILO
    d. A movie line
15. A debugger in computer science is a
    a. Tool to remove viruses
    b. Tool to load test programs
    c. Tool to help identify and remove errors in your code
    d. Tool that does nothing
16. PROG, LOAD, STORE would be good examples for
    a. An assembly language syntax
    b. An interpreted language syntax
    c. A compiled language syntax
    d. None of the above
17. Syntax errors are more difficult to detect than run-time errors.
    a. TRUE
    b. FALSE
18. Identify the memory that is not associated with computers
    a. Physical Memory
    b. Logical Memory
    c. Virtual Memory
    d. Long Term Memory
19. Which of the following is not used to enhance the efficiency of Main Memory
    a. Pages
    b. Frames
    c. Swapping algorithms
    d. Over clocking
20. In communications "Simplex" means
    a. Data can be transferred in only one direction at each instance
    b. Data can be transferred in only one direction
    c. Data ban be transferred in both directions at the same time
    d. None of the above
21. TCP/IP is one example of the OSI model
    a. TRUE
    b. FALSE
22. Cyclic redundancy check is used in networks
    a. To improve throughput
    b. To improve accuracy
    c. For error checking
    d. None of the above
23. C programs are more prone to buffer overflow errors than Java programs because
    a. Java is a better programming language
    b. C is more difficult to program with
    c. C is generally used in more critical applications
    d. Java has automatic garbage collection

24. Which of the following are <u>not</u> basic data types in the C programming language
    a. Int
    b. Float
    c. Double
    d. String
25. The logical design of a database is called a/an
    a. ER diagram
    b. Logical diagram
    c. Schema
    d. Conceptual design
26. Dynamic memory allocation is closely linked with
    a. CPU
    b. Bus
    c. Dynamically allocated arrays
    d. None of the above
27. The chronological order of programming languages are
    a. Assembly, Machine, High level languages
    b. Machine, High level languages, Assembly
    c. High level Languages, Machine, Assembly
    d. Machine, Assembly, High level languages
28. Which of the following expressions evaluates to the largest number?
    a. The prefix expression + * - 2 3 5 7
    b. The infix expression 2 + 3 * 5 – 7
    c. The infix expression (2+3) * (5 – 7)
    d. The postfix expression 2 3 + 5 7 - *
29. Which sorting algorithm would you use to order 2,1,3,4,5,6,7,8,9,10 in the shortest time (ascending order)
    a. Quick sort
    b. Merge sort
    c. Selection sort
    d. Insertion sort
30. When studying complexity of algorithms, "NP" stands for
    a. Non performing complexity
    b. Non performing algorithms
    c. Nondeterministic polynomial complexity
    d. Non polynomial complexity algorithms

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. Print the output of the following program as it would on your computer screen.

```
Main( )
{
    for(int j = 10; j>=0; j--){
            for(int i =0; i<=j; ){
                    switch(i){
                    case 0: i+=2; break;
                    case 1: i+=5; break;
                    case 2: i+=8; break;
                    default: i+=1;
                            }
            printf("%d,", i);
                        }
    printf("\n");
            }

}
```

2. Write a simple C++ program that takes any number between 1 and 12 from the user, and outputs its multiplication table. Any other number should result in an error. The smaller the code the better.
3. Briefly define all the seven stages of the waterfall model of software development
4. List all the 5 layers of the TCP/IP model and briefly explain what happens in each layer.

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 - Study the Table Employee and answer the questions below.

Table_name: Employee

Id	Name	Cur_Salary	Start_date	End_date	Increment	Subject	Year
1	Tshering	10000	12/12/1997	NIL	500	History	1997
2	Dawa	12000	12/10/1989	NIL	700	Math	1989
3	Sonam	10000	12/12/1997	NIL	500	English	1997
4	Karma	10000	12/12/1997	NIL	500	Dzongkha	1997
5	Tenzin	10000	12/12/1997	NIL	500	Science	1997
6	Tashi	12000	12/12/1989	NIL	700	Geography	1989
7	Kezang	12000	12/1/1989	NIL	700	Social Studies	1989
1	Tshering	15000	12/12/1997	NIL	700	English	2000
5	Tenzin	15000	12/12/1997	NIL	700	Physics	2001
4	Karma	15000	12/12/1997	NIL	700	Bhutan History	2003
3	Sonam	12000	12/12/1997	NIL	700	English	1997
7	Kezang	17000	12/1/1989	NIL	700	Environment	2005

Q1. Study the table above and explain in your own words what is wrong with it? (5 marks)

Q2. How would you go about improving the table above? Please redraw your optimized tables and explain what you did using database jargon. (20 marks)

Q3. Using standard SQL commands query your new table/s to list all employees who got a pay raise but did not change their subject. (10 marks)

Q4. Draw an Extended Entity Relation Diagram of your new table/s. (5 marks)

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Case 2: Network- Answer the question below about Networks and Systems

Q1. Please list out all the layers in the OSI model and explain briefly what each layer is responsible for. (15 marks)

Q2. The Transmission Control Protocol (TCP) is responsible for reliable transmission of information using a connection-oriented service. Please explain or describe in your own words how TCP achieves this. You can use diagrams too. (15 marks)

Q3. While implementing a Local Area Network (LAN), list all the equipments that maybe required. Also describe, in your own words, the utility of the equipments and why it is necessary for the LAN? (10 marks)

Q4. *Ping* or ICMP packets are used to check the reliability of networks and availability of remote hosts/servers/nodes. If you were asked to provide more detailed information about the link, including number of hops, information on the nodes passed etc, what command would you use? Also describe how this command works. (You can assume you are using either a Windows/Unix/Linux machines) (10 marks)