

**ROYAL CIVIL SERVICE COMMISSION
TECHNICAL GRADUATES SELECTION EXAMINATION 2007
PAPER - III**

**DEGREE: B.TECH & B.ENG
MAJOR: COMPUTER SCIENCE & ENGINEERING**

15 November 2007

INSTRUCTIONS:

1. The writing time for paper is **150 MINUTES**
2. The paper is divided into two parts: **Part A and Part B**. All questions in both the parts are **COMPULSORY**
3. Part A consists of 30 questions of one mark each (30 marks) and 4 short answer questions of 5 marks each (20 marks)
4. Part B consists of two case studies and candidates will be required to attempt one question only (50 marks)
5. All answers must be written on the question Book itself, within the space provided for each question

PART A

(Marks 30 x 1)

Multiple choice questions: Circle the number, which you think is the most appropriate answer.

1. The Schema of the Table is as given below:

```
CREATE TABLE <tablename>
(
  Id Number (2) PRIMARY KEY,
  Name Varchar (20),
  Roll Varchar (15),
  Major Varchar (20)
);
```

Which of the INSERT query is NOT CORRECT?

- A. INSERT (Id, Name, Roll, Major) INTO <tablename> VALUES (1, 'Dorji', '07/201', 'Network Security');
- B. INSERT INTO <tablename> VALUES (1, 'Dorji', '07/201', 'Network Security');
- C. INSERT (Id, Name, Major) INTO <tablename> VALUES (1, 'Dorji', 'Network Security');
- D. INSERT INTO <tablename> VALUES (1, '07/201', 'Network Security');
2. Consider the following C function:
- ```
int foo (int n)
{ static int i = 1;
 if (n >= 5) return n;
 n = n + i;
 i ++;
 return foo (n);
}
```
- The value returned by foo(1) is
- A. 5  
B. 6  
C. 7  
D. 8
3. The best data structure to check whether an arithmetic expression has balanced parentheses is a
- A. Queue  
B. Stack  
C. List  
D. Tree
4. The Boolean function  $x'y' + xy + x'y$  simplifies to:
- A.  $x'y'$

- B.  $x+y$
- C.  $x+y'$
- D.  $x'+y$

5. Which one of the following is NOT shared by the threads of the same process?
- A. Stack
  - B. Address Space
  - C. File Descriptor Table
  - D. Message Queue
6. Consider the following message  $M = 1010001101$ . The cyclic redundancy check (CRC) for this message using the divisor polynomial  $x^5 + x^4 + x^2 + 1$  is :
- A. 01110
  - B. 01011
  - C. 10101
  - D. 10110
7. All of these are achieved by Normalization EXCEPT
- A. Decomposition of data into two-dimensional tables
  - B. Preservation of duplicate values of data in tables
  - C. Elimination of any relationships in which table data doesn't fully depend on the primary key of a record
  - D. Elimination of any relationship that contains transitive dependencies.
8. Which of the following statements is FALSE regarding a bridge
- A. Bridge is a layer 2 device
  - B. Bridge reduces collision domain
  - C. Bridge is used to connect two or more LAN segments
  - D. Bridge reduces broadcast domain
9. A table has fields F1, F2, F3, F4, F5 with the following functional dependencies  $F1 \rightarrow F3$   $F2 \rightarrow F4$   $(F1, F2) \rightarrow F5$ . In terms of Normalization, this table is in
- A. 1 NF
  - B. 2 NF
  - C. 3 NF
  - D. None of these
10. The language  $[0^n 1^n 2^n \mid 1 \leq n \leq 10^6]$  is
- A. Regular
  - B. Context-free but not regular
  - C. Context-free but its complement is not context-free
  - D. Not context-free

11. What is output for the following program?

```
#include<stdio.h>
main()
{
 unsigned char i;
```

```
for(i=0;i<300;i++)
{
printf("*");
}
}
```

- A. 299
- B. 300
- C. infinite
- D. none

12. In recursion, the data structure used is:

- A. List
- B. Stack
- C. Queue
- D. Tree

13. Size of(int) is:

- A. Always 2 bytes
- B. Depends on compiler that is being used
- C. Always 32 bits
- D. Can't tell

14. What type of Language is C++?

- A. Machine
- B. Procedural
- C. Assembly
- D. Object-oriented

15. What will be the output of the following program:

```
#include<iostream.h>
int i=20;
void main()
{
 int i=5;
 cout << "i=" << i << ", ::i=" << ::i;
}
```

- A. i=5, ::i=20
- B. i=20, ::i=5
- C. i=20, ::i=20
- D. i=5, ::i=5

16. What does RAID stand for?

- A. Recurrent Arrangement of Initialized Data
- B. Random Array of Inexpensive Disks
- C. Redundant Array of Inexpensive Disks
- D. Random Array of Initialized Data

17. In the ACID properties for preserving integrity of table data during the transaction, the ACID stands for:
- A. Atomicity, Concurrency, Isolation, Durability
  - B. Atomicity, Consistency, Isolation, Durability
  - C. Atomicity, Concurrency, Integrity, Durability
  - D. Atomicity, Consistency, Integrity, Durability
18. Which of these is NOT a condition for resource deadlock
- A. Sharable Resources
  - B. Hold-and-Wait
  - C. No Preemption
  - D. Circular Waits
19. An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be
- A. 255.255.0.0
  - B. 255.255.64.0
  - C. 255.255.128.0
  - D. 255.255.252.0
20. In DBMS, the SQL stands for:
- A. Standard Query Language
  - B. Simple Query Language
  - C. Structured Query Language
  - D. Software Query Language
21. Which of the following does the compiler keep?
- A. File Allocation Table
  - B. Symbol Table
  - C. Mapping Table
  - D. Hash Table
22. Which protocol does the 'ping' command use?
- A. HTTP
  - B. FTP
  - C. ICMP
  - D. ARP
23. Consider the SQL statement "CREATE TABLE NEW AS SELECT \* FROM EMP"
- A. The SQL statement is a correct one
  - B. New is reserved work and there is an error
  - C. You can't select anything while creating a table
  - D. NEW should have been in quotes
24. Which statement is true about Java:
- A. *javac* is a interpreter while *java* is a compiler
  - B. both are compilers

- C. both are interpreters
- D. *javac* is a compiler while *java* is an interpreter

25. The goal of structured programming is to
- A. have well indented programs
  - B. be able to infer the flow of control from the compiled code
  - C. be able to infer the flow of control from the program text
  - D. avoid the use of GOTO statements
26. The minimum number of page frames that must be allocated to a running process in a virtual memory environment is determined by
- A. the instruction set architecture
  - B. page size
  - C. physical memory size
  - D. number of processes in memory
27. The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?
- A. 2
  - B. 3
  - C. 4
  - D. 6

28. Consider the following C program

```
main ()
{
 int x, y, m, n;
 scanf ("%d %d", &x, &y);
 /* Assume x > 0 and y > 0 */
 m = x; n = y;
 while (m != n)
 { if (m > n)
 m = m - n;
 else
 n = n - m;
 }
 printf ("%d", n);
}
```

The program computes

- A.  $x + y$ , using repeated subtraction

- B.  $x \bmod y$  using repeated subtraction
  - C. the greatest common divisor of  $x$  and  $y$
  - D. the least common multiple of  $x$  and  $y$
29. The address resolution protocol (ARP) is used for
- A. Finding the IP address from the DNS
  - B. Finding the IP address of the default gateway
  - C. Finding the IP address that corresponds to a MAC address
  - D. Finding the MAC address that corresponds to an IP address

30. Assume the following C variable declaration

```
int *M [10], N [10][10];
```

Of the following expressions:

- i.  $M[2]$
- ii.  $M[2][3]$
- iii.  $N[1]$
- iv.  $N[2][3]$

Which of the following will not give compile-time errors if used as left hand sides of assignment statements in a C program?

- A. I, II, and IV only
- B. II, III, and IV only
- C. II and IV only
- D. IV only

### Short Answer (20 Marks)

1. Discuss briefly the Waterfall and Spiral Models for project life cycle. Also discuss the strengths and weaknesses of both the models. (5 Marks)

2. With respect to object-oriented programming explain:
  - a. Polymorphism (1 Mark)

- b. Inheritance (2 Marks)



c. Abstraction (1 Mark)

d. Encapsulation (1 Mark)

3. Answer the following questions on DBMS:

a. Define Primary Key and Foreign Key. What is the difference between them? (2 Marks)

b. What is the difference between a Database Manager and a Database Administrator? (1 Mark)

c. Explain the Relational database Model with a suitable example. (2 Marks)

4.

a. Name a Micro-kernel based Operating System. (1 Mark)

b. Differentiate between OSI and TCP/IP Models (4 Marks)

## PART B

1. Consider the following Hospital database schema: (50 marks)

**DOCTOR** (docLicenseNo, name, specialty, location, telephone) – *Doctor has License No docLicenseNo*

**PATIENT** (patientIDCardNo, name, gender, dateofbirth, policyId) – *Patient with ID card No. patientIDCardNo is covered by Insurance Policy policyId*

**APPOINTMENT** ( appNo, appDate, appFrom, appTo, docLicenseNo, patientIDCardNo) – *Appointment appNo is appointment for Patient patientIDCardNo with Doctor docLicenseNo*

**POLICY** (policyId, policyFrom, policyTo, insuranceCompName) – *Policy bearing policyId belongs to Insurance Company insuranceCompName*

**BILL** (billNo, billName, fee, payMethod, status, appNo) – *The bill bearing no. billNo is for appointment appNo*

**INSURANCECOMP** (insuranceCompName, telephone, address) – *Insurance Company insuranceCompName is located at address*

**ACCEPT** (docLicenseNo, insuranceCompName) – *Doctor bearing License No. docLicenseNo accepts policy from Insurance Company insuranceCompName.*

- a. Draw the E-R diagram from which the above schema might have been derived. Specify the keys.
- b. Convert the thus obtained E-R diagram into relational database tables which are normalized so that redundancy is removed.

2. Druk Air Corporation Limited wants to build an Airline Reservation System to improve the efficiency of their working system and to improve customer service delivery. The entities identified are Passenger, Travel Agent, Flight, Ticketing Officer, Airline Manager and Druk Air Management. For the abovementioned system:
  - a. Draw and explain briefly the Context Diagram or system flow diagram
  - b. Draw and explain briefly 1<sup>st</sup> level Data Flow Diagram