

**ROYAL CIVIL SERVICE COMMISSION**  
**BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2010**  
**EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION for ICT (3 YEARS) GROUP**

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Date	:	November 24, 2010
Total Marks	:	100
Duration	:	2 $\frac{1}{2}$ Hours
Reading Time :		15 Minutes (Prior to commencement of writing)

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**INSTRUCTIONS**

1. This paper consists of **9** pages. Ensure that you have all of them.
2. This paper consists of 2 Sections, Section A of 50 marks and Section B of 50 marks.
3. Section A contains two parts. Part A consists of 30 multiple choice questions of 1 mark each with a total of 30 marks. Part B consists of 4 short answer questions of 5 marks each with a total of 20 marks. You are required to **attempt all** questions in this section.
4. Section B contains two case studies of 50 marks each. You are required to **attempt only one** of them. If both have been attempted, only the first will be marked.
5. If any question or part of a question is not clear, make reasonable assumptions and attempt the question. Assumptions must be clearly stated in the answer sheet.
6. All Answers must be written in separate answer sheets provided. Answers written on question papers will **not be accepted**.

## SECTION A (50 marks)

### Part I (30 x 1 = 30)

- 1) The use of physiological properties for identification for security purposes is called \_\_\_\_\_.  
(a) Fingerprints (b) cryogenics (c) biometrics (d) cybernetics
- 2) \_\_\_\_\_ is not a method of security attack.  
(a) Encapsulation (b) spoofing (c) sniffing (d) hacking
- 3) In the OSI model HTTP works at layer \_\_\_\_\_.  
(a) 4 (b) 5 (c) 6 (d) 7
- 4) In software testing white box testing examines \_\_\_\_\_.  
(a) Internal logical structure  
(b) Input and output with focusing on the internal logical structures  
(c) Both (a) and (b)  
(d) None of the above
- 5) E1 refers to bandwidth size of \_\_\_\_\_ mbps.  
(a) 2 (b) 4 (c) 12 (d) 20
- 6) IP address 127.0.0.1 is called \_\_\_\_\_ address.  
(a) Loop front (b) reserved (c) loop back (d) class A
- 7) A network device used to filter traffic between two or more networks is called \_\_\_\_\_.  
(a) hub (b) switch (c) router (d) firewall
- 8) \_\_\_\_\_ is not a software development model.  
(a) Waterfall (b) spiral (c) software capability (d) PERT chart
- 9) Which one of the following key types is used to enforce referential integrity between database tables?  
(a) Candidate key (b) primary key (c) foreign key (d) super key
- 10) Which subset of Structured Query Language is used to create and modify a database schema?  
(a) Data definition language (b) data structure language  
(c) database schema language (d) database manipulation language
- 11) Kinley is a security administrator for a bank's network. To detect hacking attempts she installed a program on her servers that imitates a well-known operating system vulnerability and reports exploitation attempts to the chief information officer. What is this strategy called?  
(a) Honey pot (b) man trap (c) firewall (d) bear trap
- 12) Binary search requires that the list to be searched is \_\_\_\_\_.  
(a) random (b) vector (c) ordered (d) none of above
- 13) The \_\_\_\_\_ determines whether a project should go forward.  
(a) Feasibility assessment

- (b) Opportunity identification
- (c) System evaluation
- (d) Program specification

14) \_\_\_\_\_ spend most of their time in the beginning stages of SDLC, talking with end users, gathering information, documenting systems and proposing solutions.

- (a) Project managers
- (b) network engineers
- (c) systems analysts
- (d) database administrators

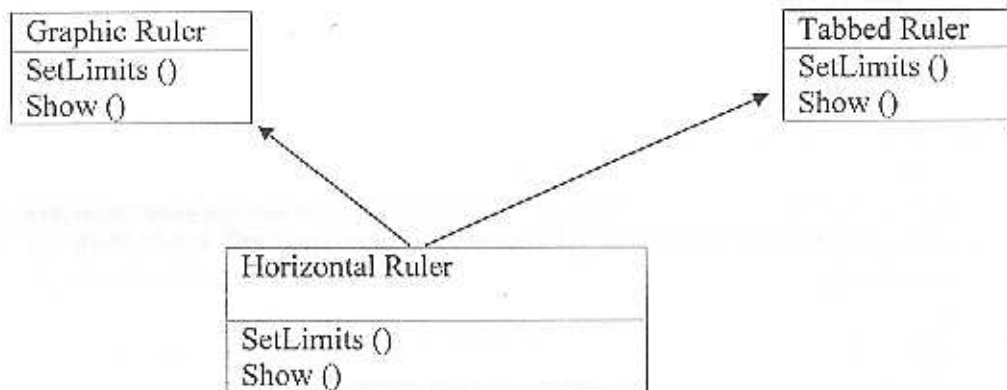
15) Which of the following is a correct *association* of a use case diagram.

- (a) Extend
- (b) exclude
- (c) except
- (d) between

16) Coupling in OOP means \_\_\_\_\_.

- (a) The measure of likeness among the elements of a module
- (b) The measure of strength of association between modules
- (c) The measure of complexity of algorithm used in the module
- (d) None of the above

17) The following is an example of \_\_\_\_\_.



- (a) Generalization
- (b) Multiple inheritance
- (c) Polymorphism
- (d) functional overloading

18) Which of the following is not a constraint to enforce integrity in a relational database?

- (a) Not Null
- (b) Unique
- (c) primary key
- (d) schema

19) Object Oriented Programming \_\_\_\_\_.

- (a) Makes programs more reliable
- (b) Simulates real life
- (c) Uses lot of difficult concepts
- (d) Is all of above

20) The actions in a Java class are called \_\_\_\_\_.

- (a) Procedures
- (b) functions
- (c) methods
- (d) subroutines

21) What is the output of the program?

```
Double bonus = 500.0;
Double sales = 200000.0;
If (sales >= 300000.0)
    Bonus += 250.0;
System.out.println ("Bonus:" +bonus);
System.out.println ("The end");
```

- (a) Bonus: 50.0  
The end
- (b) Bonus: 250.0  
The end
- (c) Bonus: 500.0  
The End
- (d) Bonus: 750.0  
The End

22) What is the output of the following program segment?

```
int n1 = 100;
int n2 = 200;
int n3 = n1 / n2;
if (n3 > 0)
{
n2 = n1;
n1 = n2;
}
else
{
n1 = n2;
n2 = n1;
}
System.out.println(n1 + " + n2); "
```

- (a) 100 200
- (b) 200 100
- (c) 200 200
- (d) 100 100

23) What is an overloaded constructor?

- (a) constructor with too many program statements.
- (b) A second constructor with the same constructor heading as the first constructor.
- (c) Second constructor with a different identifier than the first constructor.
- (d) A second or other multiple constructor with a different signature than any

other constructor.

- 24) Partial dependence on a concatenated key in a relational database table violates \_\_\_\_\_.
- (a) 1 NF            (b) 2 NF            (c) Primary key constraint    (d) ACID rule
- 25) A class, which can use all the features of an established class, is
- (a) a static class.  
(b) a superclass.  
(c) a subclass.  
(d) overloaded.
- 26) DNS query uses the following protocol and port combination.
- (a) TCP and port 53  
(b) UDP and port 125  
(c) Http and port 80  
(d) UDP and port 53
- 27) The Boolean expression  $A \geq B$  is equivalent to which of the following expressions?
- (a) not ( $A > B$ )  
(b) not ( $B \geq A$ )  
(c) not ( $A < B$ )  
(d)  $A \neq B$
- 28) The do..while loop is ideal for loop structures that
- (a) repeat some process a fixed number of times.  
(b) must execute some process at least one time.  
(c) must check the loop condition before the loop body is executed.  
(d) do all of the above.
- 29) When the encryption key cannot be calculated from the decryption key and vice versa in a reasonable amount of time the cryptography algorithm used is \_\_\_\_\_.
- (a) Symmetric  
(b) Asymmetric  
(c) Asymptotic  
(d) All of the above
- 30) What is the primary purpose of an Iterator object?
- (a) To add new objects to a collection.  
(b) To step through the objects of a collection one at a time.  
(c) To play an audio clip.  
(d) To display a graphical object.

**Part II (4 x 5 = 20)**

- 1) Name the four characteristics required of all database transactions. Explain any one of them.
  
- 2) Write a C program to produce a multiplication table. The program must get an integer input and output its multiplication table from 1 to 12. The program should check for valid input from the user. If the input is not an integer but something else like a character, then it should provide an appropriate message and get the input again. If the input is zero, the program doesn't do anything but outputs a message "Any number multiplied by zero is a zero". Below is an example of how an output should look (when the user inputs integer number 9)  
 $9 \times 1 = 9$   
 $9 \times 2 = 18$   
 $9 \times 3 = 27$   
 $9 \times 4 = 36$   
 $9 \times 5 = 45$   
 $9 \times 6 = 54$   
 $9 \times 7 = 63$   
 $9 \times 8 = 72$   
 $9 \times 9 = 81$   
 $9 \times 10 = 90$   
 $9 \times 11 = 99$   
 $9 \times 12 = 108$
  
- 3) What do you understand by Polymorphism in OOP? List two other concepts of OOP.
  
- 4) In the Internet world servers are said to reside on "well-known ports". What does this mean? Outline how ports are used (both in the initial and in subsequent packets) as a document is retrieved from a WWW server.

## SECTION B (50 marks)

There are two case studies in this section. You are required to choose and attempt only one of them.

### Case 1

Multi-Enterprise is a big company dealing in about 10 business lines such as computers, furniture, software, consultancy, mining of gold and precious metals, beverages, etc. Each line of business is headed by a chief executive officer (CEO). The whole company is controlled by a Board of Directors (the Board for short). The company is head quartered in the capital city (a fairly small city) of the country. The headquarters of different line businesses are all located in that city, but at different locations; some are at the heart of the city while others are at the periphery. There are about 100 – 200 people working in each of the head quarter offices. The enterprise has offices in different parts of the country, one in each of the 40 provinces with about 50-100 people in each. These provincial offices serve all the head offices.

Each head/provincial office has a local area network, their own website, an HR system, a procurement system, a budget system and a mail system. The ICT systems are taken care by an ICT section with 2 network administrators, 2 database managers, a programmer, 3 technicians and a help desk with two more technicians. The section is headed by a chief ICT Officer. Each office is connected to the internet through 45 mbps leased line connections.

### Questions

You are an ICT expert brought in by the Board of Directors to look at how the ICT is organized in the company with the final objective to streamline and make ICT more efficient and cost effective.

- 1) Pictorially document the local area network in a typical office, mentioning the kinds of servers the network might contain, the systems the office has, connectivity, and all network equipments. Show clearly DMZ and appropriately locate the servers and systems they have. For each of the servers you would encounter name potential server software or software systems you might see. (10 marks)
- 2) If appropriate IP addressing had been employed, what class of IP addressing would you expect to see in the LAN and why? For each of the servers identified above in 1) assign IP addresses. State a reason why some servers might have more than one IP address. What

kind of IP addresses could these be? Assign these IP addresses also to appropriate servers.  
(10 Marks)

- 3) The head quarter offices of the company are not directly connected to each other. The Board feels the need to connect all the company offices in the capital city through their own dedicated network; wide area network. This will make transfer of information between the different offices more secure and would also facilitate use of collaborative facilities such as video conferencing. **List the different options available to the company for creating the company wide area network (WAN) and recommend the most appropriate one giving all reasons possible.** Once the WAN is created in the capital, the Board have decided to connect provincial offices securely to the WAN using the infrastructure of one of the ISPs. What kind of connectivity should the company pursue to establish this connection from the city WAN to the provinces? (10)
- 4) Identify the problems with the current overall ICT set up of the company. Suggest steps to improve it as the Board of the company desires. (10 marks)
- 5) ICT and information security is another area that requires improvement. There isn't any security policy that is being followed in the company. You have been asked to come out with such a policy document. List all elements that you would reflect in the security document. (10)

## Case 2

Khephen Company deals in hardware trading. The company supplies different hardware items depending on orders received from customers.

Invoices are sent to customers for clearing payment after supplying the items in the order to the customers.

The company currently manages the information in a spreadsheet. A sample of the spreadsheet is shown below.



Invoice no	Date	Customer name	Customer Address	Item ID	Item Description	Item Quantity	Item Price	Total Item Price	Total Order Price
125	2/3/2010	Tashi	Changangkha	T400	Laptop	1	Nu. 40,000	Nu. 40,000	Nu. 44,100
				A89	Adaptor	4	Nu. 400	Nu. 1600	Nu. 44,100
				U21	USB Drive	5	Nu. 500	Nu. 2500	Nu. 44,100
126	5/4/2010	Pema	Matathang	PC755	Dell Desktop	1	Nu. 25,000	Nu. 25,000	Nu. 75,000
				M25	Mobile Phone	5	Nu. 10,000	Nu. 50,000	Nu. 75,000

The company has realized that the current approach of information management will not be sustainable and efficient as the spreadsheet becomes larger. The company has decided to use a software solution that supports Relational Database Management capability.

Based on the case given above provide clear and concise solutions to the following questions.

- 1) State three possible problems that the company may face if it continues to use the old approach of information management using spreadsheets. (10 marks)
- 2) Provide an E-R model of the new solution as the company switches operation from spreadsheet to RDBMS. In the E-R model clearly identify all the attributes, relationships and their cardinalities. (10 marks)
- 3) What Relational Database Management Solution software would you recommend to the company? State additional resources the company must acquire when migrating the information management from the old spreadsheet system to the one you are recommending. If you make any assumptions, state them clearly. (10 marks)
- 4) What is Normalization in RDMS? What are some of the advantages and disadvantages of normalizing relations in a database design? (10 marks)
- 5) From your E-R model construct the relational database tables. Your final database tables construct must be in Third Normal Form. Clearly explain how the final table structures fulfill Third Normal Form requirement. (10 marks)

\*\*\*\*\* END \*\*\*\*\*