

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR ICT

Date	: October 9, 2022
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 3 Short Answer Questions
All questions under SECTION A are **COMPULSORY**.
 - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part on a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **8 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. If ROSE is coded as 6821, CHAIR is coded as 73456, and PREACH is coded as 961473, then what will be the code for SEARCH?
 - a) 246173
 - b) 214673
 - c) 214763
 - d) 216473
2. Find the value of x in $42 : 20 :: 64 : x$
 - a) 31
 - b) 32
 - c) 33
 - d) 34
3. What tag is used in html to display a web page inside a web page?
 - a) <iframe>
 - b) <page>
 - c) <content>
 - d) <aside>
4. Select the correct selector to hide an element with id="test"?
 - a) \$("test").hide()
 - b) \$("#test").hide()
 - c) \$(".test").hide()
 - d) "\$test").hide()
5. Convert the given infix notation into postfix notation.
 $((a + b) * c) - d$
 - a) $a + b * cd -$
 - b) $ab + c * d -$
 - c) $abc+c*d$
 - d) $a+bc*-d$
6. Which of the following range of IP addresses is Class C?
 - a) 172.16.x.x
 - b) 192.168.x.x
 - c) 128.13.x.x
 - d) All of the above

7. Choose the correct order of the bubble sort of the following given array in 4th iteration:
Given array = [3, 1, 2, 7, 5, 8, 4]
- a) [1,3,2,7,5,8,4]
 - b) [1,2,3,7,5,8,4]
 - c) [1,2,3,4,5,7,8]
 - d) [1,2,3,5,7,8,4]
8. Which of the following is the HTML Comments?
- a) <?-- →
 - b) <!-- →
 - c) <!-- --!>
 - d) </-- →
9. What is the octal equivalent of decimal 425?
- a) 643
 - b) 654
 - c) 652
 - d) 651
10. _____ is a collection of similar data elements stored at contiguous memory locations.
- a) List
 - b) Collection
 - c) Array
 - d) None of the above
11. What is one gigabyte equivalent to?
- a) 1024 KB
 - b) 1024 MB
 - c) 1024 BITS
 - d) 1024 GB
12. Which of the following is/are major issues arising out of the growing reliance on information technology?
- i. Profitability
 - ii. Security threats
 - iii. Privacy concerns
- Choose the correct option:
- a) i and ii Only
 - b) i and iii Only
 - c) ii and iii Only
 - d) All of the above
13. A variable which is declared inside a method is called _____ variable.
- a) Public
 - b) Private
 - c) Local
 - d) Static

14. In OOP, when two or more methods in the same class have the same name but different parameters, it is called:
- Overriding
 - Overloading
 - Multiplexing
 - Duplexing
15. Which of the following is **NOT** the mobile app development framework?
- Ionic
 - Flutter
 - React Native
 - Laravel
16. Which topology combines characteristics of linear bus and star topologies?
- Ring topology
 - A hybrid topology
 - A tree topology
 - Mesh topology
17. How many hosts/machines can be attached to a network using a class B address?
- 65534
 - 128
 - 256
 - 16,777,212
18. Mapping of name to an IP address is done by:
- Address Resolution Protocol
 - Domain Name Server
 - Reverse address resolution protocol
 - Ethernet
19. What are the subnet masks in dotted decimal notation for /20 networks?
- 255.255.252.0
 - 255.255.255.0
 - 255.255.254.0
 - 255.255.240.0
20. _____ means that the data contained in the database is both accurate and consistent.
- Data Binding
 - Data Mining
 - Data Integrity
 - Data Checking
21. The DBA grants different types of _____ for data access to the various users of the database.
- Permission
 - Grants
 - Authorization
 - All of the above

22. Which of the following methodologies seeks to develop software by a Trial and Error approach?
- OOB
 - Structured Programming
 - Evolutionary Programming
 - None of above
23. Choose the odd tag of the HTML:
- table
 - td
 - tr
 - form
24. A table column that contains values that are primary-key values in another table.
- Primary Key
 - Relation Key
 - Foreign Key
 - Value Key
25. If a relation has several candidate keys, one is chosen arbitrarily to be the _____ key.
- Primary
 - Foreign
 - Candidate
 - Secondary
26. In a hierarchical database, the parent-child relationship is:
- Many to Many
 - Many to one
 - One to one
 - One to Many
27. A sorting algorithm which can prove to be a best time algorithm in one case and a worst time algorithm at another time:
- Selection Sort
 - Quick Sort
 - Heap Sort
 - All of the above
28. Which of the following is the feature of queue?
- LIFO
 - LILO
 - FIFO
 - FILO
29. A new technology which provides the ability to create an artificial world and have people interact with it is called:
- Tele-communication
 - Tele-virtuality
 - Virtual Reality
 - 3D Reality

30. As network administrator, what is the subnet mask that allows 510 hosts given the IP address 172.30.0.0?
- a) 255.255.0
 - b) 255.255.248.0
 - c) 255.255.252.0
 - d) 255.255.254.0

PART II – Short Answer Questions [20 marks]

This part has 3 Short Answer Questions. Answer ALL the questions. Mark for each sub-question is indicated in the brackets.

1. Complete the following C program to sort the given array;

```
void main ()
{
    int SIZE = 10;
    int inputArray[SIZE] = {10, 23, 14, 12, 9, 4, 11, 5, 1, 2};
    //Declare required variables below (3 marks)
    .....
    //Write outer loop (1 marks)
    {
        //Write inner loop (1 marks)
        {
            //Complete condition check (1 marks)
            if(inputArray[?] > inputArray[?])
            {
                //Write code to swap numbers (3 marks)
            }
        } // inner loop end
    } //outer loop end
    //Print the sorted array (1 marks)
    .....
}
```

2. What is DNS and IP? How are they related to each other, give one example? [2+2+1 marks]
3. What do the following acronyms stand for? (5 marks)
- a) DHCP
 - b) DNS
 - c) FQDN
 - d) WWW
 - e) ERP

SECTION B: Case Study [50 marks]

Choose either CASE I OR CASE II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

Recently one of the offices was set up with a new management team to provide public services. The management decided to have the following features in the database system:

- ❖ Online system to be developed, where users can lodge the appointment for the service.
- ❖ Publish public information and announcements on the site by webmaster.
- ❖ System should have secure user registration and integrated with the external system for validation.
- ❖ Different level of system users with different privileges to be maintained.

Based on the above requirements, answer the following questions;

1. Design/Sketch the master template page of the website containing: Logo, header, footer, menus, main content, news link, vacancy link **[10 marks]**
2. What are the available front end, back end tools? Which one you will use in this project as front end and back end and why? **[10 marks]**
3. What is RDBMS and give 3 examples of databases that are commonly used? **[5 marks]**
4. CRUD is commonly used in system development, what is its acronym and who uses it? **[5 marks]**
5. Identify the required entities and attributes of the entity. Draw ERD diagrams and their relationships. **[10 marks]**
6. Write one INSERT, SELECT, DELETE and UPDATE statements for any above one entity. What is the Primary key? **[10 marks] OR**

Write the SQL query for the following:

Select a record from the *Employee* whose *EmpID* is '202201001' **[2 mark]**

Select all record from the *Employee* whose *firstName* starts with 'John' **[2 mark]**

Delete all records from the *Employee* whose *EmpID* is '202101002' **[2 mark]**

Update all *lastName* of the *Employee* to 'Dojee' whose *EmpID* starts with '2020....' **[4 marks]**

CASE II

Recently, a new private company has called for a campus network design and you are being asked to lead the team in designing the campus network. The campus network is a network that has multiple LANs interconnected.

The LANs are located in multiple buildings close together and interconnected with switches and routers. So, you as the network team leader, you are required to do the planning and design of a very simple campus network that includes network design, IP subnetting, VLAN configuration, and routed network configuration.

Based on the above required information, answer the following questions;

1. Provide a physical network design connecting 4 LANs illustrating the core, distribution and access layers of the required campus network. Label the required hardware appropriately with short description of the design to address traffic congestion and redundancy. **[15 marks]**
2. Prepare the IPv4 planning for 4 LANs that can support 200 users or devices. **[15 marks]**
3. Where is the campus backbone located in the layers of the campus network that you are proposing? **[2 marks]**
4. In what layer are the campus network servers (web, email, DHCP, DNS etc) located? **[2 marks]**
5. Considering that there are no budget constraints, what type of media (fiber-optic cable or twisted-pair cable) would you choose to interconnect networks in the campus network and why? **[2 marks]**
6. What does AAA stands for in network security? **[4 marks]**
7. What is HTTPS and SSL? Which among HTTPS and SSL is safer and why? **[4 marks]**
8. What is VPN? What are some of the advantages of the VPN and list down the different types of VPN. **[6 marks]**

TASHI DELEK