

**ROYAL CIVIL SERVICE COMMISSION**

**BHUTAN CIVIL SERVICE EXAMINATIONS (BCSE) 2011  
EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for B.TECH & B. ENGG.  
(COMPUTER SCIENCE & ENGINEERING)**

**DATE: 30 October 2011**

**TOTAL MARKS: 100**

**TIME: 2.5 HOURS (150 MINUTES)**

**READING TIME: 15 MINUTES**

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**INSTRUCTIONS:**

1. Write your Roll Number clearly on the answer booklet in the space provided.
2. The first 15 minutes are being provided to check the number of pages, printing errors, clarify doubts and read the instructions. You are **NOT PERMITTED TO WRITE** during this time.
3. Use either **Blue** or **Black** ink pen or ball point pen for the written part and **H.B. Pencils** for the sketches and drawings
4. **All ANSWERS** must be written on the **ANSWER BOOK** provided. Candidates are not allowed to write anything on the question paper.
5. All answers must be labeled with appropriate question numbers (Section, Question and sub-Question Numbers wherever applicable). **Unlabelled answers will not be assessed.**
6. This question booklet consists of **11 pages** (including this page). It is divided into two sections, namely **SECTION A** and **SECTION B**.
7. **SECTION A** carries fifty (50) marks and consists of two (2) parts. **Part I** and **Part II**. **Answer all questions in this section.**  
  
**Part I** consists of 30 multiple choices questions carrying one (1) mark each (30 marks).  
**Part II** consists of four (4) short-answer questions of five (5) marks each (20 marks).
8. **SECTION B** carries fifty (50) marks containing two (2) case studies. Choose and answer **ANY ONE** case study.

**PART – A**  
**(50 Marks)**

*All answers in this section must be written on the Answer Book provided.*

**SECTION – I (30 Marks):**

**Multiple Choices:** Select the most appropriate answer. There is only one correct answer in the list. Answers that contain more than one selection will not be graded. Choose only **ONE** answer.

Mark the correct answer letter (**a,b,c or d**) against the Question number in your **Answer Book**.

**Example:**

**Q. The wrapping up of data and functions into a single unit (called class) is known as:**

- A. Data Abstraction
- B. Inheritance
- C. Data Encapsulation
- D. Polymorphism

**Answer: Q – C**

**1. Which of the following defines the byte order used by a 4-byte word on a x86 processor?**

- A. big endian
- B. little endian
- C. reverse order
- D. HSB First

**2. What is the output of the following ‘C’ program?**

```
main()  
{printf (“%x”, -1>>4);}
```

- A. ffff
- B. 0fff
- C. 0000
- D. fff0

**3. If  $A \text{ XOR } B = C$ , then:**

- A.  $A \text{ XOR } C = B$
- B.  $B \text{ XOR } C = 0$
- C.  $A \text{ XOR } B \text{ XOR } C = 1$
- D.  $A \text{ XOR } B \text{ XOR } C = 0$

**4. 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

**5. Moving process from main memory to disk is called:**

- A. Caching
- B. Termination
- C. Swapping
- D. Interruption

**6. Technician A says that a spanning tree protocol prevents looping, while Technician B says that a VLAN is one collision domain.**

- A. Technician A is correct
- B. Technician B is correct
- C. Both Technician A and Technician B are correct
- D. Both Technician A and Technician B are incorrect

**7. The maximum number of nodes in a binary tree of depth 10 :**

- A. 1024
- B.  $2^{10} - 1$
- C. 1000
- D. None of the above

**8. Part of a program where the shared memory is accessed and which should be executed indivisibly, is called :**

- A. Semaphores
- B. Directory
- C. Critical section
- D. Mutual exclusion

**9. The parsing technique that avoids back tracking is :**

- A. Top-down parsing
- B. Recursive – descent parsing
- C. Predictive
- D. Syntax Tree

**10. How many distinct binary search trees can be created out of 4 distinct keys?**

- A. 5
- B. 14
- C. 24
- D. 42

**11. Which of the following technique is employed by routers while broadcasting so that packets are not sent back to the source?**

- A. first-come first-serve
- B. split horizon
- C. shortest path first
- D. cyclic redundancy check

**12. The best known example of a PAN is :**

- A. Ethernet
- B. FDDI
- C. IEEE 802.3
- D. Bluetooth

**13. Which of the following routing protocols require an autonomous system number?**

- A. OSPF
- B. EIGRP
- C. RIP version 2
- D. BGP

**14. Which of the following statement is true regarding *Wireshark*?**

- A. It is 3-D multi-player internet game
- B. It is a network packet sniffer application
- C. It is a firewall for wired networks
- D. It is an open proxy server freely available for download

**15. A hacker may deploy which of the following techniques to pirate a legal software?**

- A. Process re-engineering
- B. Reverse engineering
- C. Null byte termination
- D. Heap-based overflow

**16. A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is : 10, 8,5,3,2. Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is:**

- A. 10,8,7,5,3,2,1
- B. 10,8,7,2,3,1,5
- C. 10,8,7,1,2,3,5
- D. 10,8,7,3,2,1,5

**17. Which OSI layer, in networking is concerned mainly with SSH:**

- A. sessions layer
- B. transport layer
- C. presentation layer
- D. applications layer

**18. Which of the following emerging technologies deals with ‘anytime, anywhere’ computing ?**

- A. mobile computing
- B. pervasive computing
- C. wearable computing
- D. ubiquitous computing

**19. While using Web 2.0 programming tools, which of the following would pull content?**

- A. RSS
- B. Weblogs
- C. Social Networking
- D. All of the above

**20. Which of the following routing protocols use link-state advertisements?**

- A. Routing Information Protocol (RIP)
- B. Enhanced Interior Gateway Routing Protocol (EIGRP)
- C. Open Shortest Path First (OSPF)
- D. Border Gateway Protocol (BGP)

**21. The following network employs MAUs for efficiency:**

- A. Token Ring
- B. FDDI
- C. Fast Ethernet
- D. Frame Relay

**22. A small user created program within a software application is called:**

- A. Applet
- B. Servlet
- C. Shell
- D. Macro

**23. Computer hardware components are manufactured based on the following industry standards managed as:**

- A. OEM
- B. ISO
- C. OSI
- D. IEEE

**24. 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

**25. Which of the following statement is incorrect with regard to amplitude modulation (AM) for data transmission?**

- A. Method of transmitting digital signals over analog systems
- B. Only amplitude of carrier signal is controlled to represent data
- C. Radio transmission devices can be used to recognize AM signals
- D. FM range of transmission is more than AM transmissions

**26. Consider a relation scheme  $R = (A, B, C, D, E, H)$  on which the functional dependencies hold:  $(A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A)$ . What are the candidate keys of  $R$ ?**

- A. AE, BE
- B. AE, BE, DE
- C. AEH, BEH, BCH
- D. AEH, BEH, DEH

**27. A context free grammar is:**

- A. Type 0
- B. Type 1
- C. Type 2
- D. Type 3

**28. Consider an operating system capable of loading and executing a single sequential user process at a time. The disk head scheduling algorithm used is First Come First Served (FCFS). If FCFS is replaced by Shortest Seek Time First (SSTF), claimed by the vendor to give 50% better benchmark results, what is the expected improvement in the I/O performance of user programs ?**

- A. 50%
- B. 40%
- C. 25%
- D. 0%

**29. An example of a distributed OS is :**

- A. Amoeba
- B. UNIX
- C. MS-DOS
- D. MULTICS

**30. Font sizes are usually expressed in points. One point is :**

- A. 0.0069 inch
- B. 0.0138 inch
- C. 0.0207 inch
- D. 0.0276 inch

## SECTION- II (20 MARKS)

### SHORT ANSWERS

All answers must be written on the **Answer Book** provided. Use only **blue** and **black** pens (ballpoint or fountain) for writing answers. All sketches and diagrams must be in **HB pencil**.

1. What do you understand by the term Server virtualization? (1 Mark)

Name three (3) types of server virtualization techniques normally deployed and briefly describe each one of them. (3 Marks)

Briefly state how virtualization helps in migration? (1 Mark)

2. What do you understand by the term DLL in programming? (1 Mark)

Briefly describe each of the following: (3 Marks)

- a. the exports
- b. the code and data
- c. the import library

Which of the above components maybe built by using the *dlltool*? (1 Mark)

3. What conditions or policy must be present for deadlock to occur? (1 Mark)

Once deadlock has been detected, some strategy is needed for recovery. Briefly describe 4 (four) possible approaches to deadlock recovery. (4 Marks)

4. With regard to information security threats what do you understand by CIAA requirements? (1 Mark)

Briefly describe the following types of threats. (4 Marks)

- a. Interruption
- b. Interception
- c. Modification
- d. Fabrication

**PART – B  
(50 Marks)**

**CASE STUDY**

***All answers in this section must be written on the Answer Booklet provided. Mark appropriate question numbers. Write answers with only blue/black ink/ballpoint pens. All diagrams and sketches must be done in HB pencils.***

**Answer ANY ONE (1) CASE Study. Each Case study carries 50 marks.**

**1. CASE STUDY: DIGITAL SHANGRILA PVT. LIMITED**

Digital Shangrila Pvt. Ltd. is a business entity based in Thimphu dealing in computers and electronic components supply and specializing in IT support services. Their Head Office and Service Center is located at Changzamtok and they have a PoS ( point of sale) at their warehouse located at Babesa. Digital Shanrila’s technicians and servicemen go out on-location for installation of hardware and troubleshooting of networks in Thimphu area and to nearby Dzongkhags and towns. The success of their business depends on a rapid response to their customer's orders and support service demands and they are considering the feasibility of updating their current computer system. As a matter of policy Digital Shangrila have no outstanding orders and pending service requests. If parts cannot be delivered when ordered, the order/part order is cancelled and customers must reorder at a later date. If the technical resources and manpower are unavailable at the time of request for services, they do not accept any service jobs. Their ordering and working procedure is as follows:

Customers place orders and service requests by post/telephone/fax/mail. Some customers bring damaged or problematic hardware and software to the Service counter in Changzamtok. For supply of computer and peripherals: The orders are checked on receipt for the correct name, address and customer's order number. This is carried out using a VDU which queries the customer file to find the Customer's Number. If the order is from new customer, their name and address is added to the customer file and a new customer's number is allocated. As the items ordered are given over the telephone or read from the customer's order form, the stock file is queried to ascertain whether the correct amount of stock is available. If it is, then the item's part number and description are automatically entered into the order shown on the VDU, and the order is then accepted and the invoice is printed together with a delivery note. When the invoice is printed, the system automatically makes an entry in the sales ledger file under the customer's number. As there is only one invoice per order, due to the "no partial order" policy, the invoice number is the same as the order number. The delivery note then sent to the dispatch unit where the goods are picked and packed and the delivery notes are part of a multipart invoice set. For services, the service requisition form is completed and sent to the Services unit where nature of problem is identified into minor and major. The minor problems are serviced on the spot whereas for major ones availability of expertise is checked. If no expertise is available then the service requisition is returned along with the computer.

The invoice along with pick–up notification is sent to the customer by mail.

Digital Shangrila has identified the following goals/expectations for the new system:

1. They want to get rid of the current policy of “no partial order” since they are losing customers
2. They want to set up a centralized network-based system where Technicians going to the field for services can access the Head office database for information on components and human resources.
3. The warehouse in Changzamtok needs to be connected to Head Office and suppliers for a smooth supply change management system

**Required:**

a. **Feasibility report:** Prepare a brief report to determine whether it is cost effective to go ahead with the new system and whether it is actually possible in the present Bhutanese context.

b. **Requirements analysis and specification:** Prepare a report identifying of the requirements and needs of the system and modeling these needs in terms of the processes carried out. Also identify both the functional and non functional requirements

c. **Logical System Specification:** Create a technical system option and the logical design of the system created. This should include the design of update and enquiry processing.

d. **Physical Design:** Design a physical database and set of queries that maybe used to generate reports for management and technicians.

e. **Networking Options:** Suggest what networking technologies/services maybe required for the new system and available options on technologies, type of services and possible vendors.

## **2. CASE STUDY: TRADITIONAL DESIGNS PVT. LIMITED.**

Mr. Sonam Dorji, the CEO/Proprietor, Traditional Designs Pvt. Limited, has asked you to help him as he launches his company’s first e-commerce Web site. In college, Sonam was a B. Com student with an artistic bent. He helped to pay his way through college by decorating sneakers, t-shirts and banners with his hand-painted traditional designs. His business grew through word of mouth and through his participation in crafts fairs. By the time he earned his degree, Sonam was running a successful business from his hostel room.

He expanded his sales efforts to include crafts fairs in nearby towns. He hired two college students to work for him, and he convinced several city gift shops to stock samples of his merchandise. The gift shops were not an ideal retail outlet for his products, however. Most people who want to buy traditionally decorated clothing and gift items want to choose specific designs or have special designs created just for them. Customers also want to choose the specific materials and items on which the design is placed. One of Sonam’s expat customers suggested that he consider selling his products on the Web.

Realizing that the Web would give Traditional Designs a chance to reach a much wider audience and would allow customers to choose design-gift combinations, Sonam began gathering information and developing estimates about his planned Web activity. He bought a digital camera and took several hundred pictures of clothes (both local and foreign), shoes, designs, and

gift item-design combinations. He then hired a local Web designer to create sample pages for the Web site, including catalog pages that contained the digital images.

When the Web designer had completed a prototype of the site, Sonam worked with the designer to calculate page sizes (including the images). The average page size was 2 MB. Sonam and his employees then navigated the prototype site several hundred times to develop an estimate of how many pages an average visitor would download. They concluded that an average site visitor would visit 50 pages during each visit. Sonam worked with the Web designer to develop estimates of activity they expect to occur on the web site during its first two years of operation. These estimates include:

- The database of Web page information (including the images) will require about 500 GB of disk space.
- The database management software itself will require about 100 GB of disk space.
- The shopping cart software will require about 2 GB of disk space.
- About 6000 customers will visit the site during the first month, and site traffic will grow about 20 percent each month during the first two years.
- The site should accommodate a peak traffic load of 1000 visitors at one time.

Sonam wants to include features (shopping cart, shipping, security and e-payment) on the site that are similar to those found on competing sites (such as Amazon.com, eBay, etc.) Sonam wants the site to provide a good experience for visitors. If the site is successful, it will generate sufficient revenue to allow an upgrade after two years. However, he does not want to spend more money than is necessary to get the site up and keep it running for the next two years.

**Required:**

- a. Determine the features and capacities (RAM, disk storage, processor speed) that Sonam should include in the web server computer he will need for his site. Summarize your purchase recommendation in a one-page memorandum to Sonam. You may include information of vendors (such as Apple, Dell, Hewlett Packard, Acer, Sun, etc.) in your memorandum.
- b. Consider the advantages and disadvantages of each major operating system that Sonam might use on the new Web server computer. In a one-page memorandum to Sonam, make a specific recommendation and support it with facts and a logical argument. If you do not believe that one operating system is clearly superior for this application, explain why.
- c. Consider the advantages and disadvantages of each major web server software package for accomplishing the goals that Sonam has for this site. In a one-page memorandum to Sonam, make a specific recommendation regarding which web server software package he should use. Provide an explanation that supports your recommendation.
- d. Recommend protection and security software packages to secure the site from virus, malware, spam, etc.
- e. Recommend **Cloud** as an alternate solution to the above by listing the benefits and solutions provided by Cloud computing. Name some Cloud vendors and the services they provide.

\*\*\*\*\* END OF QUESTION PAPER \*\*\*\*\*