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ST BENEDICT'S COLLEGE



SUBJECT	Information Technology	PAPER	Theory
GRADE	11	DATE	July 2017
EXAMINER	Mrs Kench	MARKS	120
NAME		MODERATOR	
CLASS		DURATION	2 hours

COGNITIVE LEVELS			
LOW ORDER	50 %	MIDDLE ORDER	23 %
		HIGH ORDER	27 %

Instructions

Write your answer on this paper in the spaces provided.

	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Total
Possible Mark	10	10	28	18	16	38	120
Actual Mark							

SECTION A

QUESTION 1

TERMINOLOGY

10 MARKS

Match the definition in Column A with the term in Column B.

Give the number and matching letter e.g. 1.1 C

Column A		Column B	
1.1	The original code file written by the programmer with the .java extension.	A.	Interrupt
1.2	A signal that prompts the operating system to stop work on one process and start work on another.	B.	Source code
1.3	The part of the CPU that directs and coordinates most of the motherboard's activities	C.	SMTP
1.4	Increasing the speed of the system clock to improve the computer's performance.	D.	NIC
1.5	A protocol for sending email on port 25.	E.	Overclocking
1.6	A hardware address that uniquely identifies each node of a network.	F.	Object code
1.7	A protocol for securely sending web sites.	G.	MAC address
1.8	A wireless technology for sending data over short distances creating a PAN.	H.	Clock Multiplication
1.9	The hardware device that connects a computer to a LAN.	I.	Bandwidth
1.10	The process of recognising a device without turning off the computer.	J.	POP3
		K.	IP address
		L.	HTTPS
		M.	Control unit
		N.	Bluetooth
		O.	HTTP
		P.	Hot swapping
		Q.	Hotspot

Write your answers in the blocks below:

1.1	B	1.2	A	1.3	M	1.4	E	1.5	C
1.6	G	1.7	L	1.8	N	1.9	D	1.10	P

QUESTION 2**TERMINOLOGY****10 MARKS**

Write down the definition for each of the terms below:

2.1 Compiler (2)

Converts source code to object code✓ after checking for syntax errors✓

2.2 Interpreter (2)

Checks for syntax errors, translates and runs✓ code line by line✓

2.3 Crosstalk (2)

Signals in adjacent wires✓ can interfere✓ with each other.

2.4 Address Resolution Protocol (2)

Relates MAC addresses✓ to IP addresses✓

2.5 Wireless Mesh (2)

WAP that cover an area✓ without cables. ✓ Only one WAP is wired into the network.

SECTION B**SYSTEM TECHNOLOGIES****QUESTION 3****HARDWARE****28 MARKS**

The academy is about to receive a new intake of student programmers and are reviewing the hardware specifications for the desktop computers they have just purchased.

Examine the hardware specifications below and answer the questions that follow.

3.2GHz quad-core Intel Core I5

8GB (two 4GB) of 1867MHz DDR3 memory;

1TB (7200-rpm) hard drive OR 256GB SSD

AMD Radeon R9 M380 graphics processor with 2GB of GDDR5 memory.

Four USB 3 ports (compatible with USB 2)

10/100/1000BASE T Gigabit Ethernet (RJ-45 connector)

3.1 The chipset of the motherboard has two main components. The Northbridge and the Southbridge.

3.1.1 Describe the function of each of these components. (2)

Northbridge connects faster components✓

Southbridge connects slower devices and components. ✓

3.1.2 For each of the components, identify a device or component in the hardware specifications that will be connected to it. (2)

Northbridge: = Core I5, RAM✓

Southbridge: SDD, or HDD, USB ports✓

3.2 The Core I5 processor has 8MB of L2 cache.

3.2.1 What is the function of this cache? (2)

Store next few instructions and data✓ to speed up slower RAM✓

3.2.2 The concept of caching is used frequently in computers. Provide TWO other uses of caching and explain how each works. (4)

Proxy cache ✓ – cache web site on a server ✓

Disk cache –✓ use RAM to store instr and data from slower HDD✓

3.3 Name the FOUR steps of the machine cycle. (4)

FETCH, ✓ DECODE, ✓ EXECUTE✓ STORE✓

3.4 The specifications allow the buyer to choose between a hard drive OR a Solid State Drive (SSD).

3.4.1 Give ONE distinguishing feature of each type of drive. (2)

Hard Drive: Mechanical, magnetic✓

SSD: No moving parts, electrical✓

3.4.2 Which type of drive would you recommend as the most appropriate choice for the developers? Justify your choice using the scenario. (2)

HDD✓ - larger capacity ✓ – less expensive – they are not moving around so weight is not a problem.

OR SDD✓ – programs will load faster✓

3.5 Explain why desktop computers have been selected for the developers over a laptop or a tablet. Provide TWO reasons in your answer. (2)

Any reasonable answer

- Large screen✓
- No need to be portable✓
- Easy to upgrade / repair

- 3.6 The BIOS is still required in a computer system today. Motivate the need for the BIOS by stating TWO important tasks it performs. (2)

BIOS

- Performs hardware test at start up✓
- Loads the OS at startup✓
- It is essential for starting up the computer

- 3.6.1 Many students confuse BIOS with CMOS. Define CMOS. (2)

Store user✓ and computer settings. ✓

- 3.6.2 Explain how CMOS and BIOS are using during the Power On Self Test (POST). (2)

BIOS uses data✓ from CMOS to run the tests to check the installed devices. ✓

- 3.7 The hardware specifications include the details of a GPU. Give TWO benefits of having a GPU. (2)

- Renders images to the screen✓
- o Will get higher resolution images✓
- o Frees the CPU to process other tasks

QUESTION 4

SYSTEM SOFTWARE

18 MARKS

- 4.1 List THREE functions the operating system must achieve for process management. (3)

- each process gets enough CPU time to carry out its task properly✓
- each process gets the other resources it needs e.g. memory, I/O, data✓
- the CPU is being used efficiently, carrying out as many processes as possible. ✓

- 4.2 Describe how interrupts are used to achieve multi processing. (3)

Each time a time process cannot continue to run, ✓ an interrupt is created o signal✓ that the process must be taken off the processor and the next process is ready to run. ✓

- 4.3 The processor listed in the hardware specs is a quad-core processor.

- 4.3.1 Explain the terms multiprocessing and multithreading. (4)

Multiprocessing : CPU✓ has more than one core✓

Multithreading : Ability of OS to allow programs to spilt themselves into multiple tasks✓ or "threads" which can be run at the same time. ✓

- 4.3.2 Explain how can multiprocessing and multithreading work together to improve the speed of processing instructions in a quad-core processor. (2)

The OS manages multiple threads from a program ✓and passes them to different processors✓ so they can be processed simultaneously.

- 4.4 The hardware specifications list 8 GB (two 4GB) DIMMS of RAM, however with an extra 2 DIMM slots.

Two of the developers are having an argument. John says that rather than getting extra RAM he is just going to configure extra virtual memory.

Peter disagrees with him and says he would rather pay for extra RAM.

- 4.4.1 What would the effect of adding extra memory be on the speed of the computer? (1)

It will run faster✓

- 4.4.2 Explain what virtual memory is and how it is used. (3)

Virtual memory is part of the storage disk✓ reserved by the OS to use as expansion✓ / overflow of memory. Memory is divided into pages which are swopped in and out of RAM✓.

- 4.4.3 Which viewpoint would you support? Why? (2)

Pay for extra RAM✓ – VM is slower to access✓

QUESTION 5

NETWORKS

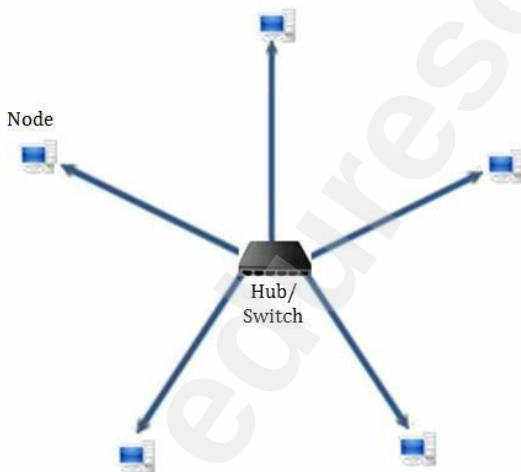
18 MARKS

The computers at the academy need to share an internet connection: therefore, the computers will be networked.

- 5.1 Different topologies may be used to set up a cabled Ethernet LAN in the coding academy.

- 5.1.1 Draw a labelled sketch to illustrate the layout of the devices in a star topology. (3)

1 mark for switch, one mark for nodes, one mark for connections



- 5.1.2 Give TWO reasons why a star topology is used in most modern LANs. (2)

Easy to set up✓

Efficient delivery of message to intended destination via switch✓

5.1.3 Name ONE other type of topology that can be used in a LAN. (1)

Ring, bus✓

5.1.4 It has been suggested that fibre would be a good cable type to use within the LAN. Give TWO reasons why this is NOT a good idea. (2)

Expensive, ✓ cannot connect to switch without convertors, ✓ cannot connect directly to devices

5.2 For each of the statements below, match the appropriate device from the following list:
access point, router, switch, server

5.2.1 A computer that is dedicated to managing network resources. (1)

Server✓

5.2.2 A device that allows wireless connections to a network. (1)

Access point✓

5.2.3 A device that is used to network multiple computers together. It delivers the message to the intended destination. (1)

Switch✓

5.2.4 These devices connect networks with the same protocol. (1)

Router✓

5.3 Give ONE advantage and ONE disadvantage of a WLAN compared to a cabled LAN. (2)

Adv : flexibility and mobility✓

Disadv : security, slower than cabled access✓

5.4 The directors of the academy have created a web site to advertise to their academy. They want the web site to be viewed on any device. Name TWO functions that the web browsers of the mobile devices need to be able to perform so that the web site can be successfully viewed. (2)

Resolution✓ - Mobile browsers optimise Web content so it is easier to view on a mobile phone screen.

Web Page Loading ✓ - Reduce images and other dynamic content to speed up Web page loading

Supported Web Languages - Write in languages supported by Web browsers✓

Dynamic Content - The memory capacity on most mobile phones is small, so dynamic content on mobile browsers either loads very slowly or cannot be seen at all

5.4.1 If the academy provides wireless connectivity, what would be the best wireless security protocol to use? Justify your answer. (2)

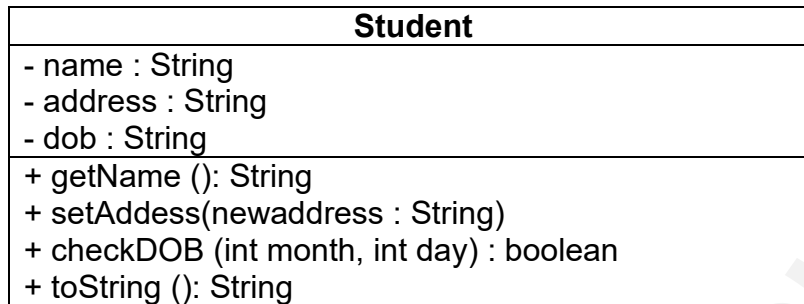
WPA 2✓ – enterprise, stronger than WPA✓

QUESTION 6

SOLUTION DEVELOPMENT

36 MARKS

- 6.1 The administrator create a Student class to store the details of each student and represents this class using a UML diagram. Examine the diagram and answer the questions that follow.



- 6.1.1 Write down the name of the accessor method using the class diagram. (1)

getName✓

- 6.1.2 Write down the name of the mutator method using the class diagram (1)

setAddress✓

- 6.1.3 The fields in the diagram are indicated to be private using the – sign. What does the + for the methods declaration? (1)

methods are public✓

- 6.1.4 Why is it good practise to make to make fields private? (2)

Control access to the field✓ so they can only be modified via mutators✓

- 6.1.5 The constructor is missing from the class diagram. What is the purpose of the constructor? (2)

Code that is processed when the object is instantiated – used to initialise ✓ the class fields✓

- 6.1.6 Write down the method header in Java of the constructor method. (2)

public Student✓ (String n , String addr, int a) ✓

- 6.1.7 The checkDOB () method determines if the student has a birthday on a given day. The month and day will be sent as a parameters and the method will return true if the month and day are the same as the student's date of birth field (dob), and false if it is not. The dob field in the Student class is in the format yy/mm/dd. A method call to this method to check if a person is born on the 14th February using the Student object sObj would be

Student Boolean bDay = sObj.checkDob(2,14);

Complete the Java method below.

(6)

```
public boolean checkDOB(int month, int day)
{
    Scanner sc = new Scanner(dob).useDelimiter("/");
    int dobm = sc.nextInt();
    dobm = sc.nextInt();
    int dobD = sc.nextInt();
    if(dobm == month) && (dobD == day)
        return true;
    return false;
}
```

6.2 Sorting an array.

Write down the name of the sort that is described below.

- 6.2.1 For each pass through the array, the sort compares adjacent elements and swaps them with the smallest element progressively moved to the end of the array.

(1)

Bubble sort

- 6.2.2 The sort takes the first element and then searches the rest of the array for the position of the smallest element, and then swaps the first element with the element indicated by the position. The process is repeated for the next element in the array after the first.

(1)

Improved selection sort

- 6.2.3 A programmer has a large array that is mostly sorted. Only one element is out of place. A bubble sort with a flag would be an efficient choice to sort this array.

a) Explain how a bubble sort with a flag works.

(4)

For each pass through the array, the sort compares adjacent elements and swaps them with the smallest element progressively moved to the end of the array. If the no swap occurs when the inner loop executes, the sort terminates.

b) How could a bubble sort with a flag efficiently to sort the array?

(2)

The first time the inner loop runs the element will be sorted correctly, the next time no swapping could occur and the sort will end.

6.3 The administrator wants to create an array class to store all the students using an array of objects.

- 6.3.1 Write down the declaration of the array to store 50 Student objects and a field to record the number of elements in the array. (4)

```
Student [] stArr = Student[50];
int size = 0;
```

- 6.3.2 Explain why a parallel array would not be a suitable data structure for this solution. (2)

Each time the parallel arrays are sorted, a swap has to be written for each array.
Each time a field needs to be added the arrays must be updated.

- 6.3.3 A method is needed in the array class to count the number of birthdays on the 14th February. Write down a Java method called countBDay() to return the number of birthdays on the 14th February as an integer. Use your declaration in 6.3.1. and the method 6.1.7. (7)

```
public int countBDay()
{
    int count = 0;
    for (int i = 0; i < size; i++)
    {
        if (stArr[i].checkDOB(2,14) == true)
            count++;
    }
    return count;
}
```