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**Student Name:** **USN:**

**Instructions:**

1. Write your answers for both Part A and Part B on the sheets attached to the question paper.
2. A maximum of one more additional sheet may be provided, if required.

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## PART – A (1 Mark each)

***Instructions***: *Choose the one most suitable option or write the answer.* **[10 * 1 = 10 Marks]**

1 Give any of the two most important responsibilities of an OS with a very brief explanation for each.

2 Mention the types of segments to which the variables declared in the program would be part of.

```
static int myVar = 100;
int myFunction(int a, int b){
  static int myInt = 10;
  return (myInt + a + b);
}
```

3 Whether the given statement below is true or false, justify your answer.
Context switch between the threads of different processes will be faster and easier.

4 What is the purpose of the 'kill' command in Ubuntu? Give a sample invocation of this command.

5 When does the transition of a process from NEW state to READY state happen?

6 In a quad core processor, how many processes could be in a Running state? Justify your answer.

7 Briefly explain why there needs to be at least two modes (user and kernel) of operations to be supported by a CPU.

8 Which are the datatypes 8 bytes wide, in the LLP64 data model of Windows?

9 Order the following, starting from the most privileged to the least privileged:
Device drivers, application software, kernel, and systems software,

10 What are CPU and I/O bursts in a program?

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**PART – B [5 * 2 = 10 marks]**

11 Assume that you have kept doc1.pdf and doc2.pdf open on your computer using Adobe Acrobat. You are also viewing RVU website using Chrome browser.
Draw and briefly explain the layout of your computer's entire main memory with the images of what you are likely to have in them.
**Note**: Assume that your computer is booted with Windows OS.

12 What is the significance of SUSPEND state? When does a process move from SUSPEND state to READY state?

13 a) Give all the commands that you would give to make the below shell script run. Assume that this file is in the directory **/home/BTech22/script**
b) When it is run, what will be the output on the terminal?
Contents of the file: **Q13.sh** (assume that it does not have any execute permissions now)

```
#!/bin/bash
echo "This is a shell script, which is Q13 in the IA1 exam!!!"
cd ..
pwd
```

14 Assume that the following commands were given to build a library.

```
gcc -c -fPIC myFile.c
gcc -shared -o libmyFile.so myFile.o
export LD_LIBRARY_PATH="/home/genius/lib"
gcc -o myExe -L/home/genius/lib myMain.c -lmyFile
```

**Answer the following questions.**

a) Whether a static or a dynamic library is getting built here?
b) What is the full name of the library file being created?
c) Where is this library file likely to be located?
d) How many copies of this library will be loaded on to the main memory, if two instances of this executable are run on this system?

15 Draw the picture of all valid state transitions of processes having the following states: New, Ready, Running, Blocked, Suspend and Exit.

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**Coverage of Course outcomes:**
**CO1: 50% and CO2: 50%**

## PART - A Answers

1. Give **0.5 marks** each, if either of the below responsibilities are given.
   Process management – Scheduling and managing the priorities of various processes.
   Memory management – Manage the main memory usage for various programs running.
   Device management – Manage the I/O devices connected to the computer.

2. Data segment: myVar and myInt - **0.5 marks** Stack segment: a and b – **0.5 marks**
   **Note**: If the answer is partially correct, reduce maximum **0.5 marks.**

3. Context switch between the threads of different processes will be faster and easier.
   **FALSE**: Since threads belonging to the different processes have different process space (code and data) context switch between them takes longer and is more time consuming.

4. **kill** command is to terminate or kill a process by providing the PID of a process to be killed. – **0.5 marks Example**: kill -9 45 (assuming 45 is a valid PID of a running process) – **0.5 marks**

5. **NEW → READY**: When the resident set (or code/data/stack is mentioned) of a process is brought from the HDD to the Main Memory, the process is moved from the New state to the Ready state. **No partial marks, only if the answer is correct, give 1 mark.**

6. In a **quad core processor**, there can be a **maximum of four processes** in the running state, because a process to be in a Running state needs to be executed by a CPU.
   **Note**: If **Hyperthreading** is mentioned and each CPU can execute two threads at a time, then, there can be **8 processes/threads** in the RUNNING state.

7. User mode is for running user processes and more secure kernel mode to run the OS or kernel code.

8. **LLP64: long long and pointer are 8 bytes wide**. – **1 mark**
   **Note**: Even if double is not mentioned, give full marks. Reduce 0.5 marks for partial answer.

9. **Most→least**: Kernel, Device drivers, systems software, and application software.
   **Note**: If the order is given in the reverse order, no partial marks.
10. CPU Burst is CPU centric processing operations done by a program which runs within the CPU, whereas I/O bursts are related to the I/O operations, with I/O devices/peripherals.

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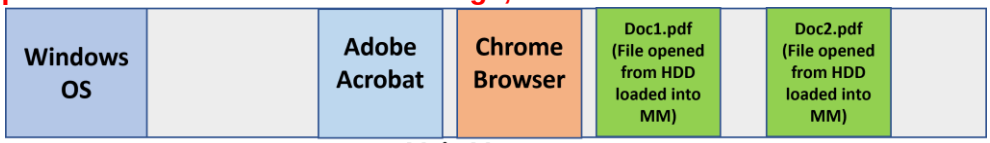
**PART - B Answers**

**11.** Picture should include the following contents. Explanation can briefly touch upon the **resident set (code/data/stack/heap)** of the below software that will be on the Main memory. **– 0.5 marks**
If the picture includes the following give marks as shown below. If list of SW/files given consider it.
**Window OS – 0.5 marks, Acrobat/Chrome – 0.5 marks, Doc1.pdf and Doc2.pdf: 0.5 marks**
**Note: If no pdf files are mentioned or OS image, reduce 0.5 marks.**



Main Memory

**12. SUSPEND state is to move the BLOCKED state processes from the Main Memory to HDD for creating more free space for other processes in the main memory. – 1 mark**
**A process moves from SUSPEND → READY, when the event it was waiting for happens and the process needs to be moved back to Main memory from HDD. – 1 mark**

**13. a) To make the script file run, any of the following commands need to be given: - 1 mark**
**chmod +744 Q13.sh or chmod +x Q13.sh**
**./Q13.sh**
**b) When this shell script runs, the output will be: - 1 mark**
**This is a shell script, which is Q13 in the IA1 exam!!!**
**/home/BTech22**

**14.**
**a) Whether a static or a dynamic library is getting built here?**
**Dynamic library is being built.**
**b) What is the full name of the library file being created?**
**libmyFile.so**
**c) Where is this library file likely to be located?**
**/home/genius/lib**
**d) How many copies of this library will be loaded on to the main memory, if two instances of this executable are run on this system?**
**Only one copy of it, because it is a shared object across many executables.**

**15. Ref the picture in Session 2C. Page 8**

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