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Operating Systems
Tutorial-4

Q1

Fork()	Vfork()
1. Child & parent process have separate memory space.	1. Child & parent process share same address space.
2. Both child & parent gets executed simultaneously.	2. One child process is executed, parent process starts its execution
3. It uses copy-on-write as an alternative.	3. It does not use copy-on-write.
4. Child process does not suspend parent process execution.	4. Child process suspends parent process execution.
5. There is a wastage of address space.	5. There is no wastage of address space.

Q2. Actions taken by a Kernel to context-switch b/w processes are →

i) The OS must save the PC & user stack pointer of the currently executing process, in response to a clock interrupt and transfers control to kernel clock interrupt handler.

ii) Saving the rest of the registers, as well as other machine state, in the process PCB is done by clock interrupt handler.

iii) The scheduler to determine the next process to execute is invoked the OS.

iv) Then, the state of the next process is retrieved from its PCB by OS & restores the registers.

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Q3. The false statement is →
D) Blocking one kernel level thread blocks all related threads.

Q4.	Process	Threads
	i) It means any programs is in execution.	i) It means a segment of process.
	ii) It takes more time to terminate.	ii) It takes less time to terminate.
	iii) It takes more time for creation.	iii) It takes less time for creation.
	iv) It takes more time for context switching.	iv) It takes less time for context-switching.
	v) It is isolated.	v) They share memory.

Q5.	Thread Context Switch	Process context Switch
	1. It occurs when CPU saves the current state of the thread & switches to another thread.	1. It occurs when the OS's handler saves the current state of running program & switches to another program.
	2. It helps CPU to handle multiple threads simultaneously.	2. It involves loading of the states of the new program for its execution.
	3. Processor's cache & translational lookaside buffer preserves their state.	3. Processor's cache & TLB gets flushed.
	4. It is a bit faster & cheaper.	4. It is relatively slower & costlier.

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Q6. In a multi-threaded process, signals in many operating systems are delivered to a specific thread within the process. The thread to which a signal is delivered is determined by the operating system's signal-handling mechanism.

Q7. The new code would be:-

```
int main (void)
{
    pid_t pid;
    int fd1[2]; fd2[2];
    char buff1[100]; buff2[100];
    pipe (fd1);
    pipe (fd2);

    pid = fork();
    if (pid > 0)
    {   close (fd1[0]);
        write (fd1[1], "Hello my child \n", 20);
        close (fd1[1]);
        close (fd2[1]);
        wait (NULL);
        read (fd2[0], buff2, 100);
        close (fd2[0]);
    }
    else
    {   close (fd1[1]);
        close (fd2[0]);
        read (fd1[0], buff1, 100);
        printf ("%s", buff1);
        write (fd2[1], "Hello my parent \n", 16);
        close (fd1[0]); close (fd2[1]);
        exit(0);
    }
}
```

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Q8. The output would be →

Hello, I am the child, var = 11
Hello, I am the parent, var = 10

Q9.

Clone_FS → Determines whether the parent & child tasks share filesystem-related system information, like the current directory and umask.

CLONE-VM → Controls memory space sharing b/w parent & child tasks. If set, they share memory; otherwise, the child has its own memory copy.

CLONE_SIGHAND → Manages sharing of signal handlers b/w parent & child tasks.

CLONE_FILES → Dictates whether parent & child tasks share open file descriptors.

Q10. Process Contention Scope (PCS) → The contention takesplace among threads within a same process. The thread library schedules the high-prioritized PCS thread to access the resources via available LWPs.

System Contention Scope (SCS) → The contention takes place among all threads in the system. In this case, every SCS thread is associated to each LWP by the thread library and are scheduled by the system scheduler to access the kernel resources.

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