

King Saud University
College of Computer and Information Sciences
CSC 227: Operating Systems

Time: 7:00pm – 8:30pm (90 minutes)

Name:

ID#:

Section#: or Teacher Name:

Total Marks: 20

Fall 2015-16

Midterm Exam II

Date: 17-Nov-2015

Instructions:

- This exam has 8 pages.
- Do not use pencil.
- Write clearly and neatly.

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Question 1. [6 marks] Select ONLY ONE ANSWER (the best answer).

Copy your answer for question 1-1 to 1-12 in the table on page2. ONLY THAT TABLE WILL BE GRADED.

1.	The <u>text segment</u> of a process address space contains:	2.	When a process is created using the classical fork() system call, which of the following is not inherited by the child process?
a.	The executable code associated with the process ✓	a.	Process address space
b.	The dynamically allocated data associated with the process	b.	Process ID ✓
c.	The statically allocated data associated with the process	c.	User ID
d.	The text-messaging chat messages for the process	d.	Open files
3.	When CPU switches to another process, the system must:	4.	Select the statement that is <u>NOT</u> true. A parent process can terminate its child process using abort() in the following conditions.
a.	Delete the PCB of the old process.	a.	Child has exceeded allocated resources
b.	load the PCBs of the new and old processes	b.	Task assigned to child is no longer required
c.	Save the state of the old process and load the saved state for the new process via a context switch ✓	c.	The parent is exiting
d.	All the above	d.	Child has finished its processing ✓
5.	In a client server systems, which element is NOT an IPC	6.	Which statement is TRUE about the <u>exec()</u> command
a.	Shared Memory ✓	a.	It replaces only the code of the calling program with a new code
b.	Remote Procedure Calls (RPC)	b.	It replaces code and data of the calling program with a new program
c.	Remote Method Invocation (Java)	c.	It replaces only the stack and the heap of the calling program
d.	Sockets	d.	It creates a new process and starts a new program in it ✓
7.	Which of the following components of a process context IS <u>NOT</u> shared by threads in a multithreaded process?	8.	A ----- provides an <u>API</u> for creating and managing threads
a.	Heap memory	a.	Thread library ✓
b.	Register values / <u>stack</u> ✓	b.	Multicore system
c.	Global variables	c.	Set of system calls
d.	Files	d.	Multithreading model

9.	In a multithreaded process, which of these models will make the whole process to block if a thread makes a blocking system call?
a.	Two-level model
b.	One-to-one model
<input checked="" type="radio"/> c.	Many-to-one model ✓
d.	Many-to-many model

10.	A thread library provides the programmer
<input checked="" type="radio"/> a.	With an API for creating and managing threads ✓
b.	With java program for mathematical calculations
c.	With C program for mathematical calculations
d.	With program to create user level passwords

11.	In deferred thread cancellation,
a.	Thread is allowed to wait until the time is over
b.	Thread is allowed to close all files
<input checked="" type="radio"/> c.	Thread is allowed to terminate itself in an orderly fashion ✓
d.	Thread is allowed to stop everything at once

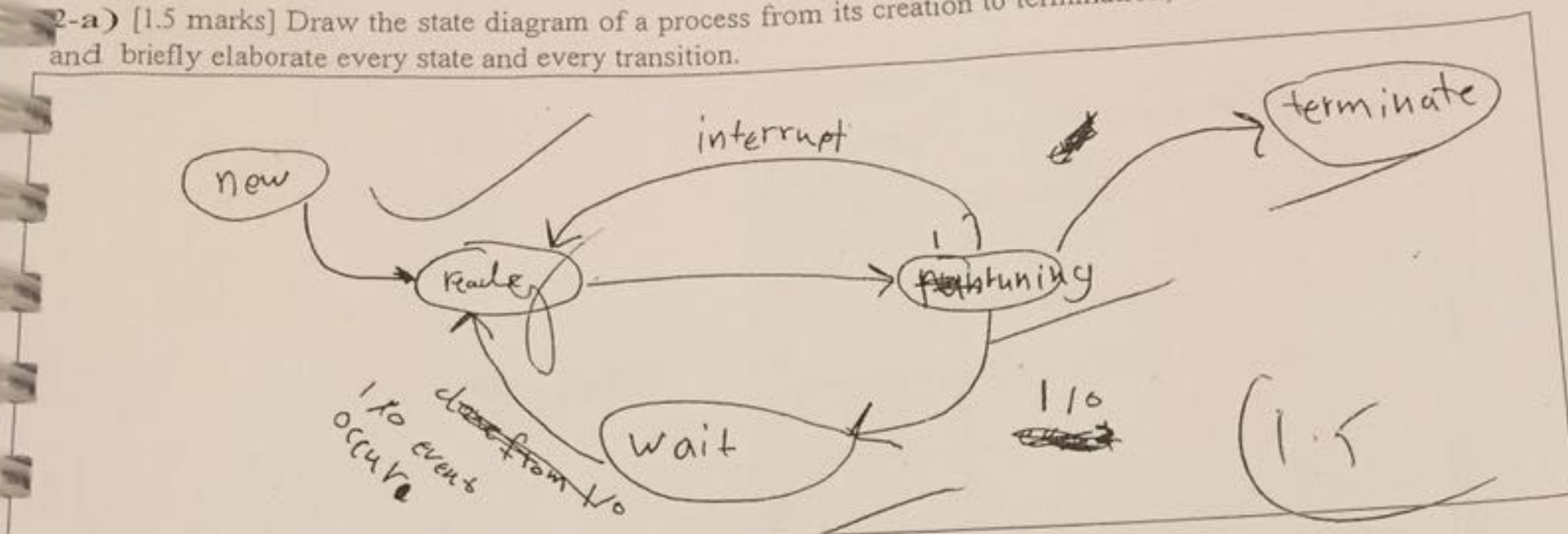
12.	Thread cancellation:
a.	Is the task of exiting the kernel
<input checked="" type="radio"/> b.	Is the task of terminating a thread before it has completed ✓
c.	Is the task of terminating all children of a process
d.	Is the task of terminating parent process

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<input checked="" type="radio"/> a	<input checked="" type="radio"/> b ✓	<input checked="" type="radio"/> c ✓	<input checked="" type="radio"/> d ✓	<input checked="" type="radio"/> a ✓	<input checked="" type="radio"/> c ✓	<input checked="" type="radio"/> b ✓	<input checked="" type="radio"/> a ✓	<input checked="" type="radio"/> c ✓	<input checked="" type="radio"/> a ✓

11.	12.
<input checked="" type="radio"/> a ✓	<input checked="" type="radio"/> b ✓

Question 2. [3.5 marks]

2-a) [1.5 marks] Draw the state diagram of a process from its creation to termination, including all transitions, and briefly elaborate every state and every transition.



new: process is being created

ready: process wait to be assigned to a CPU for executing

wait: process wait for some event to occur

running: process is CPU executing the process. terminate: process is terminated

2-b) [1 mark] What does a PCB contain?

1. process state
2. program counter
3. CPU register
4. CPU scheduling information
5. memory management information
6. Accounting information
7. I/O information

2-c) [1 mark] Explain and describe three different types of processes scheduler.

1. long term scheduler: decide which process should be added to the ready queue

2. short term scheduler: which process should be next to execute and assigned to CPU

3. mid term scheduler: used in time sharing and it decrease the degree of multiprogramming by execute part of the process and swap it out and the swap it in again

Question 3. [3.5 marks]

3-a) [2 marks] Consider the following program. Write the output of all the programs in correct order?

```
main() {
    if (fork() == 0) {
        sleep (10);
        printf( "I was sleeping\n" );
    }
    else {
        printf( "Hello my son\n" );
        if (fork() == 0)
            printf( "Hello Dad\n" );
        else {
            sleep (2);
            fork();
            printf( "End\n" );
        }
    }
}
```

Zero

The child processes should be numbered as follows: Parent, Child1, Child2, Child3, Child4, ...

#	Process	Output
1	Parent	I was sleeping
2	Child	I was sleeping
3		
4		
5		
6

3-b) [1 point] Describe how a process is removed from the system after it terminates execution.

☒ by de allocating ~~the~~ resource from the process.
The OS ~~allocate~~ all resource from it.

3-c) [0.5 point] When a process dies, what happens to its children?

the children should be die too! but some time it will not and this will make like zombie children and we should detect them to kill them? when?

0.25

3.5

Question 4. [3.5 marks]

4-a) [1.5 marks] Amdahl's law is formulated by the following equation: $speedup \leq \frac{1}{S + \frac{(1-S)}{N}}$ where S is the serial portion of the program and N is the number of processing cores.

Consider a program with a serial portion of 50% that will be executed on processor with 2 cores. What is the maximum speedup according to Amdahl's law? 2

What is the maximum speedup if N is very large? 5 so high speed

Does it worth running this program on a 100 processing cores? Yes it does zero

4-b) [1 mark] Describe two ways for implementing a thread library.

1. by the kernel has it 1. by make the kernel has it

2. make it with programming languages libraries

$$3) = \frac{1}{0.75} = \frac{1}{0.5 + 0.5} = \frac{1}{0.5(\frac{1+1}{2})} \quad | \quad Speed = \frac{1}{S + \frac{(1-S)}{N}} \text{ part}$$

4-c) [1 mark] Why should a web server not run as a single-threaded process?

Because the server receives lots of clients requests and ~~it can't~~ so we can't ~~use~~ in same time

X so it want to manage all of these request by single-thread so what??

3/3.5

Question 5. [3.5 marks]

5-a) [1.5 marks] Describe at least TWO advantages of using thread pool. *win*

1. easy to create thread

2. easy to terminate thread

5-b) [1.5 marks] Explain two general approaches of process cancellation. *thread*

1. ASyn croness: kill the thread immediately

2. deferred: the target thread check if it should be to cancel the thread

5-c) [1 mark] Give an example of thread cancellation in a multithreaded environment.

for example in web browser you play sound media

and download something, and opening same web page

if ~~cancel~~ you cancel the download then the thread

that downloading it will be canceled