Ring Banb Shr		King S College of Con Compu	aud Univ nputer and Informa iter Science Depart	ersit ation Scienc tment	y es
		Course Code:	CSC 227		
		Course Title:	Operating Syste	ms	
		Semester:	Fall 2017-2018		
		Type of Examination:	Final Exam.		
Student	t Name:				
Student	t ID:				
Student	t Section No.				
Instruct	tor Name:				
Tick the Relevant	Computer So	cience B.Sc. Program ABET Stude	ent Outcomes	Question No. Relevant Is Hyperlinked	Covering %
X	a) Apply knowled computer science	ge of computing and mathemat ce;	ics appropriate to the	Q.1	25%
Х	b) Analyze a prob requirements ap	lem, and identify and define the oppropriate to its solution	computing	Q.2-Q.4	50%
Х	c) Design, implem component, or p	nent and evaluate a computer-ba program to meet desired needs;	ased system, process,	Q.5	25%
Х	d) Function effect	ively on teams to accomplish a	common goal;		
		Full	Mark	Student's	Mark
	Question No.1		7		
	Question No.2		3.0		
Question No.3			3.0		
Question No.4			3.0		
Question No.5			5		
Question No.6			9		
Question No.7			10		
Total			20		

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Question 1. [5 Marks: CLO (a)] Select ONLY ONE ANSWER (the best answer).

Copy your answer for question 1-1 to 1-16 in the table on page2. ONLY THAT TABLE WILL BE GRADED.

1.	When an external device becomes ready to be serviced by the processor the device sends a(n) signal to the processor.
А.	Access
B.	Halt
C.	Handler
D.	Interrupt

3.	Logical extension of multiprogramming operating system is
A.	time sharing
В.	multi-tasking
C.	single programing
D.	both a and b

5.	A Process Control Block(PCB) does not contain which of the following :
A.	Code
B.	Stack
C.	Bootstrap program
D.	Data

7.	In priority scheduling algorithm:
A.	CPU is allocated to the process with highest priority
B.	CPU is allocated to the process with lowest priority
C.	Equal priority processes cannot be scheduled
D.	None of the mentioned

10	
2.	The user and kernel modes define the
A.	Client mode
В.	Dual-mode of operation
C.	Symmetric mode
D.	None of the above

4.	Environment in which programs of computer system are executed is:
А.	operating system
B.	nodes
C.	clustered system
D.	both a and b

6.	The state of a process is defined by:
	1 5
A.	the final activity of the process
В.	the activity just executed by the process
C.	the activity to next be executed by the process
D.	the current activity of the process
8.	Process are classified into different groups in
A.	shortest job scheduling algorithm
B.	round robin scheduling algorithm
C.	priority scheduling algorithm
D.	multilevel queue scheduling algorithm
 D. D. 8. A. B. C. D. 	process the current activity of the process Process are classified into different groups i shortest job scheduling algorithm round robin scheduling algorithm priority scheduling algorithm multilevel queue scheduling algorithm

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9.	Multiple tasks performed by an application can be implemented by separate threads to:	10.	In com semant
А.	Update display	<mark>A.</mark>	change be imp duplica thread.
B.	Fetch data	B.	change the wea
C.	Spell checking	C.	Change comes threads thread.
D.	All of the above	D.	remain

10.	In comparison to single threaded program, semantics of fork() system call:	
<mark>A.</mark>	change in a multithreaded program, fork can be implemented in two ways, one that duplicate all threads, or duplicate the calling thread.	
B.	change in a multithreaded program based on the weather.	
C.	Change in a multithreaded program, if fork() comes after knife(), then it will duplicate all threads, if not it will duplicate the calling thread.	
D.	remains the same in multithreaded program.	

11.	Which memory organization method makes it easy to implement shared memory	
A.	Contiguous Allocations with base and limit registers	
B.	page table	
C.	Segment table	
D.	Inverted page table	

12.	To be able to implement virtual memory, it is necessary to use:
A.	Compile time binding
B.	Load time binding
C.	waiting time binding
D.	Execution time binding

13	In two-level paging scheme, to access one data,
15.	we need:
A.	1 memory accesses.
B.	2 memory accesses.
C .	3 memory accesses.
D.	4 memory accesses.

A. Less number of framesB. reduced size of page table
B. reduced size of page table
C. it is required by the translation look aside buffer
D. reduced number of pages

Please copy your answer for question 1-1 to 1-14 in the following table:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
D	В	D	Α	С	D	А	D	D	А
11	12	13	14						
В	D	С	В						

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Question 2. [1x 3= 3 Marks: SO(c)]

2.1 What is the difference between Job queue and ready queue?

Job queue – set of all processes in the system. Ready queue – set of all processes residing in main memory, ready and waiting to execute.

2.2 Describe why direct memory access (DMA) is considered an efficient mechanism for performing I/O.

Data transfer requires only one interrupt as opposed to multiple interrupts for slow device

2.3 Describe the purpose of a device driver.

Device Driver for each device provides uniform interface between controller and kernel.

Question 3. [3 Marks: SO(b)]

Recognize and name the group of services that an operating system should provide through system calls.



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Question 4. [3 Marks: SO(b)]

Recognize and name the states of the CPU and the both processes P1 and P2during a switching phase.

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Question 5. [5 Marks: CLO4 – SO(a)] Dr. Fawaz

5.1 A multithreaded process (consist of more than one thread) shares some sections or resources. Some resources are shared among threads and some other are unique to each thread. Classify the following sections and resources into either **shared** (for shared among threads in a single process) or **Unique** (not share among threads in a single process) (**3 Marks**).

Sections or Resources	Shared or Unique
Code	Shared
Files	Shared
Data	Shared
Stack	Unique
Registers	Unique
Thread Local Storage (TLS)	Unique

5.2 Amdahl's Law identifies performance gains from adding additional cores to an application that has both serial and parallel components. (*S* is serial portion and *N* processing cores):

$$speedup \le \frac{1}{S + \frac{(1-S)}{N}}$$

You have given the following facts:

- The cost of each core is \$100.
- Parallel portion of the program is 0%

What are the optimal number of cores you would recommend? and why? [2 marks]

Based on the given facts, the optimal number of cores are one, because adding additional cores would cost more but will not enhance the performance.

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Question 6. [9 Marks: SO(a)-S(b)-S(c)]

6.1 Assume the following processes, each with its arrival time and burst time.

Process	Arrival Time	Burst Time
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

For SJF Non-Preemptive job scheduling, draw the Gantt chart and calculate the average waiting time.

4

6.2 Assume the following processes, each with its arrival time and burst time.

Process	Arrival Time	Burst Time
P1	0.0	7
P2	2.0	2
P3	4.0	1
P4	5.0	4

For FCFS job scheduling, Calculate the average waiting time is _____

3.75

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Question 7. [10 Marks: SO(a)-S(c)]

Question 7.1 [1.5 marks]:

a) Consider an 8-bit system using paging architecture, where 3 bits are used for page number and 5 bits are used for page offset [1.5 marks]:.
 Page number

page number	page offset	
p1	d	
3 bits	5 bits	

Page #	Frame #
000	100
001	011
010	001
011	101

Consider the following page table of a process P1.

Find the physical address corresponding to each of the following logical addresses:

1.	Address 01111001. Physical address is: 10111001.
2.	Address 01000110. Physical address is: 00100110
3.	Address 10101010. Physical address is: Invalid page number

Question 7.2: [8.5 marks]:

Consider the following memory representation, where free areas are indicated with their sizes. The filled areas are indicated with their sizes and the process number.

Draw the final memory state after executing the following events in sequence. Use memory maps given below to answer the question.

- 1. P7 Arrives (requires 14KB),
- 2. P8 Arrives (requires 10KB),
- 3. P9 Arrives (requires 7KB),
- 4. P6 TERMINATED
- 5. P10 Arrives (requires 16KB)
- 6. P11 Arrives (requires 11KB)

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	P1	P2		P3		P4		P5		P6	
10K	10K	8K	20K	6K	18K	4K	7K	9K	12K	12K	15K

P8	P1	P2	P7		P3	<mark>P9</mark>	<mark>P11</mark>	P4		P5	P10	
<mark>10K</mark>	10K	8K	<mark>14K</mark>	<mark>6K</mark>	6K	<mark>7K</mark>	11K	4K	7K	9K	<mark>16K</mark>	<mark>23K</mark>

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	P1	P2			P3		P4		P5		P6		
10K	10K	8K	201	K	6K	18K	4K	7K	9K	12K	12K	15K	
P8	P1	P2	<mark>P11</mark>		P3	P10	P4	P9	P5			P7	Ē
10K	10K	8K	11K	<mark>9K</mark>	6K	16K	2 /K	7 K	9K	24K		14K	1

b) Use Best-Fit Allocation technique: [3 marks]

c) Use Worst-Fit Allocation technique: [2.5 marks]

	P1	P2		P3		P4		P5		P6	
10K	10K	8K	20K	6K	18K	4K	7K	9K	12K	12K	15K

	P1	P2	P7		P3	<mark>P8</mark>		P4		P5	<mark>P10</mark>		<mark>P9</mark>	
10K	10K	8K	<mark>14K</mark>	<mark>6K</mark>	6K	<mark>10K</mark>	<mark>8K</mark>	4K	7K	9K	<mark>16K</mark>	<mark>8K</mark>	<mark>7K</mark>	<mark>8K</mark>

No sufficient place for P11.

End of the Exam.