Алну Source		King Sa College of Cor Comp	ud Un nputer and Inform uter Science Depa	iversi ation Sciences rtment	ty
		Course Code		CSC 227	
			One	rating Systems	
		Course fille.	Fa	12016-2017	
		Semester: Exercises Cover Sheet:	Fir	al Exam	
St	udent Name:				
	Student ID:				
Stud	ent Section No.				
Tick the Relevant	Computer Scienc	e B.Sc. Program ABET Stuc	lent Outcomes	Question No. Relevant	Cover %
Х	a) Apply knowledg computer scien	ge of computing and mathematics a ice; (1.1)	appropriate to the	Q. 1	
Х	b) Analyze a prob requirements a	lem, and identify and define the cor ppropriate to its solution	nputing	Q.3, Q.5, Q.6	
х	c) Design, implem component, or	ent and evaluate a computer-based program to meet desired needs;	l system, process,	Q.2, Q.7, Q.8, Q.9	
х	d) Function effect	ively on teams to accomplish a con	nmon goal;		
	e) Understanding issues and resp	rity, and social			
	f) Communicate e	ffectively with a range of audience	s;		
	g) Analyze the loc organizations a	al and global impact of computing nd society;	on individuals,		
	h) Recognition of professional de	the need for, and an ability to enga evelopment;			
	i) Use current tec	hniques, skills, and tools necessar			
	j) Apply mathema science theory in a way that de design choices	itical foundations, algorithmic prine in the modeling and design of com monstrates comprehension of the ;			
	k) Apply design a software syster	nd development principles in the cons of varying complexity;	onstruction of		

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Question 1. (10 marks) Select ONLY ONE ANSWER (the best answer).

Copy your answer for question 1-1 to 1-20 in the table on page4. ONLY THAT TABLE WILL BE GRADED. (your answer should be one of the letters A, B, C or D)

1. Handheld computers are	2.	No boss processor and each processor performs all tasks
A. Resource poor, optimized for usable battery life.	ility and A.	Asymmetric Multiprocessing
B. Resource poor optimized for high per-	formance B.	Symmetric Multiprocessing
C. Resource rich, optimized for usability ar	d battery C.	Multitasking
D. All of the above	D.	Multiprogramming
3. Graphical Processing Unit (GPU)	4.	System call pass parameters by
A. Renders advanced graphics.	A.	Simplest: Register
B. Used for general numerical processing	B.	Parameters stored in a block, or table, in memory, and address of block passed as a parameter in a register
C. Physics simulations for games.	C.	Parameters pushed , onto the stack by the program and popped off the stack by the OS.
D. All of the above	D.	All of the above
5. the designers of MS-DOS had no choi leave the base hardware accessible	ce but to 6.	State of a process that is not currently running, but expected to use I/O in a while
Because hardware architecture for which A. written provides no dual mode and no protection	ch it was hardware A.	Waiting
B. Because hardware architecture for which written provides provide dual mode.	ch it was B.	Ready
C. MSDOS was based on multi-mode hard	ware. C.	Running
D. None of the above	D.	New
xx71 • • • • •	1. 1	
7. been expired, which of the followin	since has g would 8.	A process that has terminated, but whose parent has not yet called wait(), is known as a

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E. The process terminates.

F. Waits for an Interrupt

happen

E. Zombie process

F. Orphan process

G. Aborted process

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H. The process will be inserted to Ready queue.

H. New process

9.	Bounded waiting implies that there exists a bound on the number of times a process is allowed to enter its critical section :	1	0.	Mutual exclusion implies that :
E.	after a process has made a request to enter its critical section and before the request is granted		E.	if a process is executing in its critical section, then no other process must be executing in their critical sections
F.	when another process is in its critical section		F.	if a process is executing in its critical section, then other processes must be executing in their critical sections
G.	before a process has made a request to enter its critical section		G.	if a process is executing in its critical section, then all the resources of the system must be blocked until it finishes execution
H.	after a process leaves its critical section		H.	Two processes are executing in their critical section.
	b • •, • • • • • • • •	_		
11.	arrives at the ready queue, its priority is compared with the priority of:	1	2.	Mutual exclusion can be provided by the:
E.	all process		E.	mutex locks
F.	currently running process		F.	binary semaphores
G.	parent process		G.	both (a) and (b)
H.	initial process		H.	none of the mentioned

13.	When several processes access the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called:
I.	dynamic condition
J.	race condition
K.	essential condition
L.	critical condition

15.	Which organization system does not allow sharing of memory areas between processes
I.	Hashed page table
J.	Inverted page table

14.	Which one of the following is a synchronization tool?
I.	Thread
J.	Pipe
K.	Semaphore
L.	Socket

16.	Associative memory is :
I.	Is a cache memory used to store data close to the CPU
J.	Is a cache memory used the DMA to accelerate data transfer

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K.	Hierarchical page table	K.	Is cache memory used by the memory management unit
L.	Segment table	L.	Is a cache memory used by device controllers to accelerate access to external devices
			Which of the following components of a program
17.	In segmentation, each address is specified by:	18.	state IS NOT shared across threads in a multithreaded process?
I.	segment number and offset	I.	Register values

J. Heap memory K. Global variables

L. Files

- J. page number and offset
- K. frame number
- L. DMA address

.9.	In deferred thread cancellation,	20.	Which system will provide the fastest memory access:
M.	Thread is allowed to wait until the time is over	M.	Compile time binding
N.	Thread is allowed to wait until the parent terminates	N.	Load time binding
О.	Thread will decide when to check if it should be cancelled	0.	I/O time binding
P.	The system will kill the thread immediately	P.	Execution time binding

Your Answer should be written in the following table:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.

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Question 2. [2.5 Marks]

2.1 Explain the concept of caching? How does it work? Why modern operating systems apply caching? (**1.5 marks**).

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2.2 (a) Many modern solutions and applications rely on clustered systems e.g. search engines, social media (Twitter, Facebook, Instagram. etc.). Explain the concept of clustering? [0.5 mark]

(b) Show the differences between asymmetric clustering and symmetric clustering? [0.5 mark]

Question 3. [2.5 Marks]

 (a) There are various ways for structuring an operating system including but not limited to (Layered approach, Modular Approach, and Microkernel), explain one approach of your choice? (1 mark)

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(b) What are the benefits of using a Microkernel approach (at least two benefits)? [0.75 marks]

(c) If you had the option to choose between modular approach or Layered approach, which approach would you choose and why? [0.75marks]

Question 4. [4 Marks]

4.1 Each process in the operating system is represented by Process Control Block (PCB). What information are contained in PCS associated to each process (at least three)? **[1.5 marks]**

4.2 (a) what is the difference between short-term scheduler and long-term scheduler in term of purpose? **[1 mark]**

(b) What is the difference between short-term scheduler and long-term scheduler in term of frequency? **[0.5 mark]**

4.3 Why a Medium term scheduler might be required? [1 mark]

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Question 5. [3 Marks]:

a) Having a program composed we would like to know if it should use multithreading or not. If the serial portion of the program is 30%, and we have a multi-core system, what will be the speedup if the parallel section of the program is divided into 4 different threads? Justify your answer. [2 marks]

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b) If we have only one processor, is there any interest in dividing the process into 4 threads? Explain. [1 mark]

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Question 6. [3 Marks]

Explain the use of Peterson's algorithm (or Peterson's solution) as a concurrent programming algorithm for mutual exclusion that allows two processes P0 and P1 to share a single-use resource without conflict, using only shared memory for communication by answering the followings:

• Give the types, names, and initializations of the variables used by Peterson's algorithm as shared memory for communication: (1 Mark).

• Write the generic codes of the processes P0 and P1 using Peterson's algorithm. (2 Marks).

Question 7. [7 Marks]

Suppose that the following processes arrive for execution at the times indicated below. Each process will run for the amount of the time listed as burst time.

In answering the questions, use **<u>non-preemptive</u>** scheduling, and base all decisions on the information you have at the time the decision must be made.

Process	Arrival Time	Burst Time			
P1	0.0	8			
P2	0.4	4			
Р3	1.0	1			

7.1 Draw the Gantt chart for these processes with the FCFS scheduling algorithm [1 mark].

7.2 Calculate the average turnaround time for these processes with the FCFS scheduling algorithm? **[2.5marks]**

7.3 Draw the Gantt chart for these processes with the SJF scheduling algorithm. [1marks]

7.4 Calculate the average turnaround time for these processes with the SJF scheduling algorithm? **[2.5 marks].**

Question 8. [3.5 marks]

(a) Consider a Memory Management System that is uses 8 bits to address the memory and a memory allocation based on segmentation. Using the below segmentation table, convert the given local addresses into physical addresses. [2.5 marks]:

Segment	Segment Base	Segment Limit
0	33	10
1	180	45
2	11	18
3	231	19

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	Find the physical address corresponding to each of the following logical addresses:
1.	Address 2, 6. Physical address is:
2.	Address 1, 25. Physical address is:
3.	Address 0, 13. Physical address is:
4.	Address 3, 6. Physical address is:
5.	Address 5, 9. Physical address is:

b) Consider a 32-bit system using Two-Level hierarchical paging architecture, as follows: [1.0 marks]:

_	Outer page number	Inner page number	page offset
	p1	d	
_	10 bits	12 bits	10 bits

The outer page table and the inner page table are stored in physical memory and that this system uses

Associative Memory.

If the access time to physical memory is 100ns and the access time to associative memory is 20ns. If the hit ratio is 80%, what is the effective access time (EAT)?

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Question. 9 [4.5 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)

a) Use First-Fit Allocation technique: [1.5 marks]

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

b) Use Best-Fit Allocation technique: [1.5 marks]

	P1	P2		P3		P4		Р5		P6	
10K	10K	8K	20K	6K	18K	4K	7K	9K	12K	12K	15K

c) Use Worst-Fit Allocation technique: [1.5 marks]

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

End of the exam.