

		King Saud University College of Computer and Information Sciences Computer Science Department	
<b>Course Code</b>		CSC 227	
<b>Course Title</b>		Operating Systems	
<b>Semester</b>		Winter 2021	
<b>Type of Examination</b>		Mid Term	<b>Duration:</b> 1.5hrs
Student Name:			
Student ID:			
Student Section No.			
Instructor Name:			

	Full Mark	Student's Mark
Question No.1	11	
Question No.2	4.5	
Question No.3	4.5	
Question No.4	5	
Total	25	

**Instructions:**

- This exam has 25 marks
- This exam has 8 pages.
- **Do not use pencil**
- No partial credit.
- Write clearly and neatly.
- Copy your answers to questions 1-1 to 1-22 in the table below. **ONLY THIS TABLE WILL BE GRADED**
- Use **CAPITAL LETTERS** when filling the table.

1.	2.	3.	4.	5.	6.	7.	8.
A	A	A	B	D	A/D	A/B	A
9.	10.	11.	12.	13.	14.	15.	16.
A	C	A	C	D	A	B	D
17.	18.	19.	20.	21.	22.		
B	C	C	D	D	D		

**Question 1.** [8 marks] Select ONLY ONE ANSWER (the best answer).

1.	In _____ multiprocessors, all processors can perform the same functions so the failure of a single processor does not halt the machine.
A.	Symmetric
B.	Asymmetric
C.	Symmetric and asymmetric
D.	Neither symmetric nor asymmetric
2.	_____ implies that a computer is simultaneously running two or more programs at the same time
A.	Multiprocessing
B.	Multitasking
C.	Clustering
D.	None of the above
3.	_____ is a software interrupt used to request a service from the operating system
A.	Trap
B.	System call
C.	Interrupt
D.	Batch
4.	_____ specifies the location (address) of next instruction to execute.
A.	Instruction register
B.	Program counter
C.	Interrupt vector
D.	Interrupt service routine
5.	The fastest of various kinds of storage devices used in a computer is _____
A.	Memory
B.	Optical disk
C.	Hard disk
D.	None of the above

6.	Major problem with handheld computers is _____
A.	Batter life
B.	Price
C.	Screen size
D.	Hardwared
7.	Some computers with or no user interface are called _____
A.	Embedded computers
B.	Real time computers
C.	Multipurpose computers
D.	Smart computers
8.	_____ is the part of OS that runs all the time.
A.	Kernel
B.	Shell
C.	Application
D.	System program
9.	Apple Mac OS X is
A.	Aqua GUI interface with UNIX kernel underneath and shells available
B.	GUI with CLI command shell
C.	CLI with optional GUI interface
D.	None of the above
10.	Methods of passing parameters to OS that do not limit the number or length parameters being passed are
A.	Registers and block/table
B.	Registers and stack
C.	Block/table and stack
D.	Registers
11.	The caller needs to know nothing about how the .... is implemented and just needs to obey .... and understand what OS will do as a result call
A.	System call , API
B.	API , system call
C.	System call, system program
D.	System program, system call

12.	Operating system service(s) that are helpful to the user:
A.	Resource allocation
B.	Protection and security
C.	Program execution
D.	All of above
13.	MS-DOS
A.	Single-tasking
B.	Single memory space
C.	Loads program into memory, overwriting all but the kernel
D.	All of the above
14.	Operating system service(s) that are for system itself
A.	Resource allocation
B.	User interface
C.	File manipulation
D.	All of above
15.	To keep track of which users use how much and what kinds of computer resources
A.	Protection and security
B.	Accounting
C.	Error detection
D.	Communication
16.	When it is created or while it is executing, a process will need _____
A.	CPU time and memory
B.	Files
C.	I/O devices
D.	All the above
17.	Among the multiple parts of a process in the ram we mentioned the heap which contains _____
A.	The code of the program
B.	Memory dynamically allocated during run time
C.	Current activity including program counter, processor registers
D.	The temporary data
18.	A Process may be described as:
A.	I/O-bound process
B.	CPU-bound process
C.	A or B
D.	A and B
19.	Swapping may be necessary _____
A.	To improve the process mix (of CPU bound and I/O bound)
B.	Because a change in memory requirements has overcommitted available memory, requiring memory to be freed up.
C.	A or B
D.	None of the above

20.	Parent process may create children processes, which, in turn create other processes, forming a tree of processes. A child process will need certain resources (CPU time, memory, files, I/O devices). The operating system must consider the policy to make _____
A.	Parent and children share all resources
B.	Children share subset of parent's resources
C.	Parent and child share no resources
D.	A or B or C
21.	A process can be terminated due to _____
A.	Normal exit
B.	Fatal error
C.	Killed by another process
D.	All of the mentioned
22.	The objective of multi-programming is to:
A.	Have some process running at all times
B.	Have multiple programs waiting in a queue ready to run
C.	To maximize CPU utilization
D.	A and C

**Question 2. (4.5 Marks)**

**a)** [1 mark] Give one example of interrupt and one example of trap.

Examples of interrupts: key pressed, power on/off, end of data transfer,

Examples of traps: illegal memory access, division by zero, system call **(1.5 Marks)**

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**b)** [1 mark] Which of the following list of operations are privileged operations (circle your answers)?

- Change to user mode
- Turn off timer interrupt
- Read the time of day
- Set the mode bit
- I/O instructions
- Clear memory

**c)** [1 mark] What is the difference between application program and system program? Give examples.

Application program is a program that processes data for user. For example, MS Word, browser etc.

System Program is a program that is used for some applications on computer system. Examples include Windows Explorer, Text Editors

**d)** [1.5 marks] Distinguish between the client–server and peer-to-peer models of distributed systems.

The client-server model firmly distinguishes the roles of the client and server. Under this model, the client requests services that are provided by the server. The peer-to-peer model doesn't have such strict roles. In fact, all nodes in the system are considered peers and thus may act as either clients or servers - or both. A node may request a service from another peer, or the node may in fact provide such a service to other peers in the system.

**Question 3. (4.5 Marks)**

**a)** [1.5 marks] Name three structures used to design an OS.

ONLY THREE: Simple structure MS-DOS, Monolithic structure Unix, Layered structure, Microkernel, Modules, Hybrid.

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**b)** [1 mark] Name one advantage and one disadvantage of layered approach?

Advantage: Simplifies debugging and system verification OR a layer does not need to know how operations at a lower layer are implemented; it needs to know only what these operations do.

Disadvantage: layers need to be carefully defined OR less efficient than other types

**c)** [2 marks] Name the two common models of Inter-process Communication and mention one advantage for each model. (2 marks)

Message passing – exchanging smaller amount of data.

Shared memory – allowing maximum speed and convenience of communication transfer status information

**Question 3. (5 marks)**

- a) [2 marks] For both user and system processes, Give 4 tasks the operating system is responsible to **perform** for these processes.

Task	Task description
1.	The creation and deletion of both user and system processes;
2.	The scheduling of processes;
3.	The provision of mechanisms for synchronization, communication,
4.	Deadlock handling for processes.

- b) [3 marks] To serve and control a process the operating system keeps information associated with each process in a Process Control Block (PCB). Give 6 components of the PCB.

Field	Component Title and Description
1.	Process ID
2.	Process state – running, waiting, etc.
3.	Program counter – location of instruction to next execute
4.	CPU registers – contents of all process-centric registers
5.	Memory-management information – memory allocated to the process
6.	Accounting information – CPU used, clock time elapsed since start, time limits
7.	I/O status information – I/O devices allocated to process, list of open files