answer

True/False Section

1) In term of message passing, **Blocking** is considered **Asynchronous:**
A) True B) False

2) The initialization of the semaphore S is 1:
A) True B) False

3) In semaphore, Signal() is the first function the process must call before it enters its critical section.
True B) False

4) When using the swap function, LOCK is initialized FALSE.
A) True B) False

5) Counting semaphore is an integer value that can range only between 0 and 1; can be simpler to implement
A) True B) False

6) Socket is a combination between the IP address and the port number
A) True B) False

7) A race condition
A) results when several threads try to access the same data concurrently
B) results when several threads try to access and modify the same data concurrently
C) will result only if the outcome of execution does not depend on the order which instructions are executed
D) None of the above
E) All of the above

2) In order to inform the CPU that an I/O operation has finished, the device controller issues:
   a) System call
   b) Hardware interrupt
   c) Trap
   d) Exception

3) In Direct Memory Access structure:
   a) No CPU intervention
   b) One interrupt is generated per block
   c) Used for high speed I/O devices
   d) A and C
   e) All of the above

4) The main purpose of multiprogramming is to:
   a) Increase CPU utilization
   b) Improve response time
   c) Increase user interactivity with the system
   d) All of the above

5) Which of the following causes the operating system to switch to kernel mode:
   a) Division by zero
   b) A system call
   c) Timer out
   d) I/O interrupt
   e) All of the above

6) Which of the following is not a process control system call:
   a) Abort b) Create c) Read d) Load

7) MAC OS X structure is:
   a) Monolithic, modular approaches
   b) Monolithic, microkernel approaches
   c) Layered, microkernel, loadable modules approaches
   d) None of the above

8) Which of the following services of the OS is helpful for the user:
   a) Protection
   b) Accounting
   c) Security
   d) Resource allocation
   e) None of the above

Given the snapshot of the ready queue in the table below, answer the following questions

Process	CPU Burst	Arrival Time
P1	135	0
P2	102	145
P3	56	200
P4	148	300
P5	125	400

Assuming the system uses the First-Come-First-Serve (FCFS) CPU scheduling policy.

24) The waiting time for process P4 is?
A) 40 B) 1 C) 3 D) 13 E) 23

25) The average waiting time for all the process in the table is.
A) 122.5 B) 121 C) 20.2 D) 40 E) 40.5

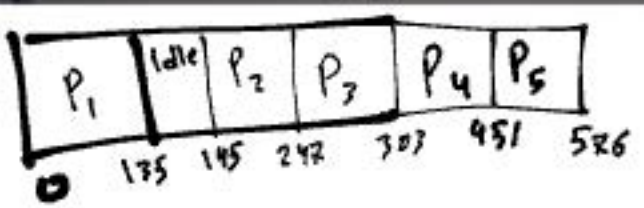
26) The maximum turnaround time is for process?
A) p1 B)p2 C) p3 D) p4 E) p5

27) Starting from time 0, the system finishes executing all process at time (Drop the arrival time)?
A) 566 B)567 C) 576 D) 550 E) 600

28) The average turnaround time for all processes in the table is.
A) 533 B)526.2 C) 576.3 D) 550 E) 600

29) Many-to-One Multithreading model is to:
A) Map many user-level threads to many kernel threads
B) Map many user-level threads to single kernel thread
C) Map many user-level threads to three kernel threads. D) None of the given choices.

30) In term of nonpreemptive CPU scheduling:
A) The process at running state will be finished first before CPU moves to the next process to be executed. B) The CPU has a time slice for the processes to be executed. C) A and B. D) None of the given choices



7 Marks]

nsider the following programs carefully and answer the question besides. [3 pts]

```
()
{
=0; i<3; i++)
();
("hello\n");
```

a) How many times does the following program prints "hello"?

Answer:

```
ain()
d_t pid = fork(); // fork #1
d = fork(); // fork #2
d = fork(); // fork #3
(pid == 0){
rk(); // fork #4

rk(); // fork #5
```

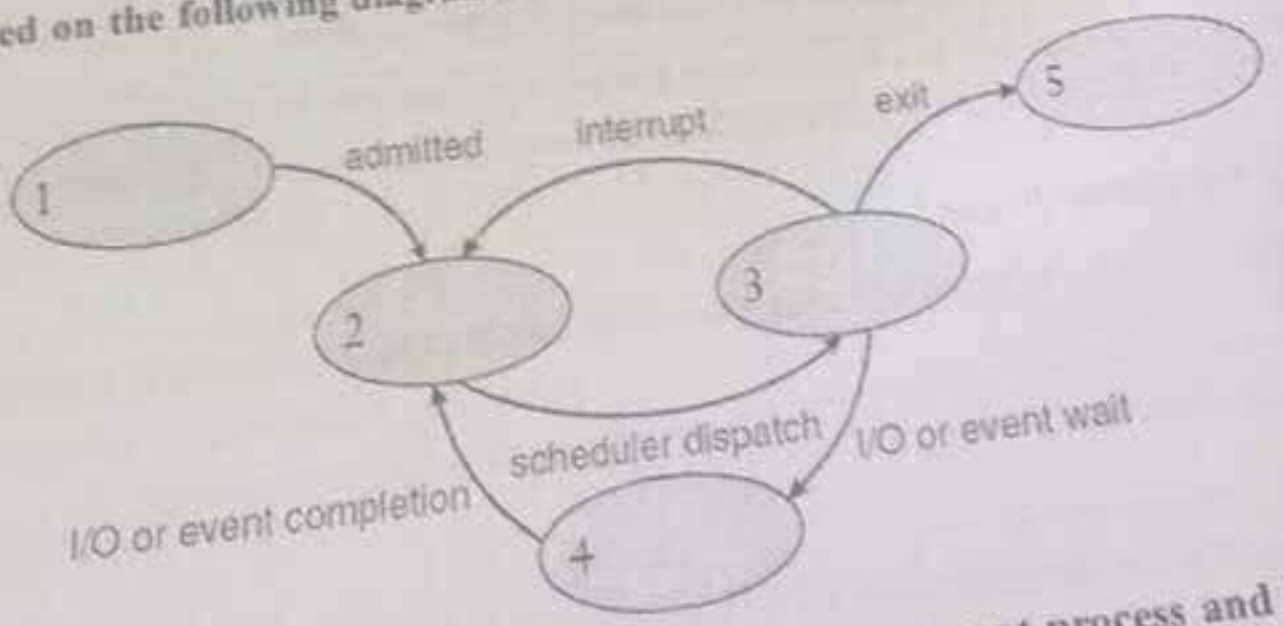
b) What is the total number of processes after fork #3?

Answer:

c) What is the total number of processes in this program?

Answer:

5) Based on the following diagram, beside each number assign the proper process state. .5 pts]



) Explain briefly resource sharing options between a parent process and its child? [1.5
]

24) Which of the following is/are safe sequence(s)?

a) <P3, P2, P1, P0> b)<P0, P2, P1, P3> c)<P2, P1, P0, P3>

d) All of the above e) There is no safe sequence

25) If P1 requests additional resources (0, 5, 2) of (A, B, C) respectively. Then:

a) The process should wait since the resources are not available.
b) The system will raise an error condition since it exceeds the need of P1.
c) The request could not be granted since it leaves the system in an unsafe state.
d) The request could be granted since it leaves the system in a safe state.

26) If P0 requests additional resources (1, 1, 1) of (A, B, C) respectively. Then:

a) The process should wait since the resources are not available.
b) The system will raise an error condition since the request exceeds the need of P1.
c) The request could not be granted since it leaves the system in an unsafe state.
d) The request could be granted since it leaves the system in a safe state.

27) What is the content of the Allocation matrix for process P1 after claiming that the reque
2) would be granted to P1?

a) (1, 5, 2) b) (0, 2, 3) c) (1, 0, 0) d) None of the above

28) Which of the following statements is true?

a) A safe state is a deadlocked state.
b) A safe state may lead to a deadlocked state.
c) An unsafe state is necessarily, and by definition, always a deadlocked state.
d) An unsafe state may lead to a deadlocked state.

29) A deadlock-free solution eliminates the possibility of starvation.

a) True b) False

30) The necessary conditions needed for the deadlock to occur:

a) No mutual exclusion, hold and wait, pre-emption, circular wait.
b) Mutual exclusion, no hold and wait, pre-emption, circular wait.
c) Mutual exclusion, hold and wait, no pre-emption, circular wait.
d) Mutual exclusion, hold and wait, pre-emption, no circular wait.

18) In remote procedure call, marshalling parameters is performed on client side w
marshalling parameters is performed on the server side.
a) True
b) False

19) One of the benefits of multithreading is to take advantage of multiprocessor arch
threads in parallel. This feature is called:
a) Responsiveness.
b) Economy
c) Scalability
d) Resource sharing
e) None of the above

20) In a many-to-one multithreading model:
a) Several threads may run in parallel on multicore architecture.
b) Only one thread can access the kernel at a time.
c) A blocking thread allows other to run.
d) A and C

**According to the following resource allocation table. Use Bankers algorithm to answe
following 7 questions:**

Process	Allocated			Max		
	A	B	C	A	B	C
P0	0	0	1	0	0	1
P1	1	0	0	1	7	5
P2	1	3	5	2	3	5
P3	0	6	3	0	6	5
Available	1	5	2			

21) The total number of instances of type (A, B, C) respectively are:
a) (3, 14, 11) b) (6, 24, 27) c) (3, 16, 16) d) (4, 21, 18) e) None of the given choic

22) What is the content of the Need matrix for process P1?
a) (2, 7, 5) b) (3, 7, 5) c) (1, 7, 5) d) (3, 12, 7) e) None of the above

23) The system is in an unsafe state.
a) True b) false

at Number:

22) One of the benefits of multithreading is to take advantage of multiprocessor architecture and run threads in parallel. This feature is called:

a) Responsiveness.
b) Economy
c) Scalability
d) Resource sharing
e) None of the above

Part B [7 marks]

Q2) Describe Four General Strategies for dealing with deadlock. [2 pts]

Q3) Assume that a deadlock was already detected, how an operating system could recover from this deadlock. [2 pts]

2) In order to inform the CPU that an I/O operation has finished, the device controller issues:
   a) System call
   b) Hardware interrupt
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3) In Direct Memory Access structure:
   a) No CPU intervention
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   c) Used for high speed I/O devices
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4) The main purpose of multiprogramming is to:
   a) Increase CPU utilization
   b) Improve response time
   c) Increase user interactivity with the system
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5) Which of the following causes the operating system to switch to kernel mode:
   a) Division by zero
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6) Which of the following is not a process control system call:
   a) Abort b) Create c) Read d) Load

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   d) None of the above

8) Which of the following services of the OS is helpful for the user:
   a) Protection
   b) Accounting
   c) Security
   d) Resource allocation
   e) None of the above

3) The system is in an unsafe state.
   a) True b)False

4) Which of the following is/are safe sequence(s)?
   a) <P3, P2, P1, P0>
   b) <P0, P2, P1, P3>
   c) <P2, P1, P0, P3>
   d) All of the above
   e) There is no safe sequence

5) If P1 requests additional resources (0, 5, 2) of (A, B, C) respectively. Then:
   a) The process should wait since the resources are not available.
   b) The system will raise an error condition since it exceeds the need of P1.
   c) The request could not be granted since it leaves the system in an unsafe state.
   d) The request could be granted since it leaves the system in a safe state.

6) Which of the following is/are affected by a scheduling algorithm?
   a) Execution time
   b) I/O time
   c) Waiting time
   d) All of the above
   e) A and B

7) Orderly execution of cooperating processes that share a logical address space so that co
   is maintained is called:
   a) *Process scheduling*
   b) *Process Synchronization*
   c) *Deadlock*
   d) *Starvation*
   e) *None of the above*

8) When several processes can access the same data concurrently and the outcome of the
   depends on the particular order in which the access takes place is called:
   a) *Starvation*
   b) *Deadlock*
   c) *Race Condition*
   d) *Synchronization*

9) A Solution to the critical Section problem must satisfy the following condition(s):
   a) *Mutual Exclusion*
   b) *Hold and wait*
   c) *Circular waiting*
   d) *All of the above*

9) Many-to-Many Multithreading model:
A) Maps many user-level threads to one kernel thread
B) Maps user-level thread to kernel thread
C) Allows many user level threads to be mapped to many kernel threads
D) None of the given choices.

8) Creating a user thread requires creating the corresponding kernel thread which time consuming is a disadvantage of:
A) Many-to-Many threads mapping model. B) Many-to-one threads mapping model.
C) One-to-One threads mapping model. D) All of the given choices.

10) Which of the following is true about Mutual Exclusion :
A) If process P_i is executing in its critical section, then other processes can be executing in their critical sections
B) If process P_i is executing in its critical section, then no other processes can be executing in their critical sections. C) A and B. D) None of the given choices.

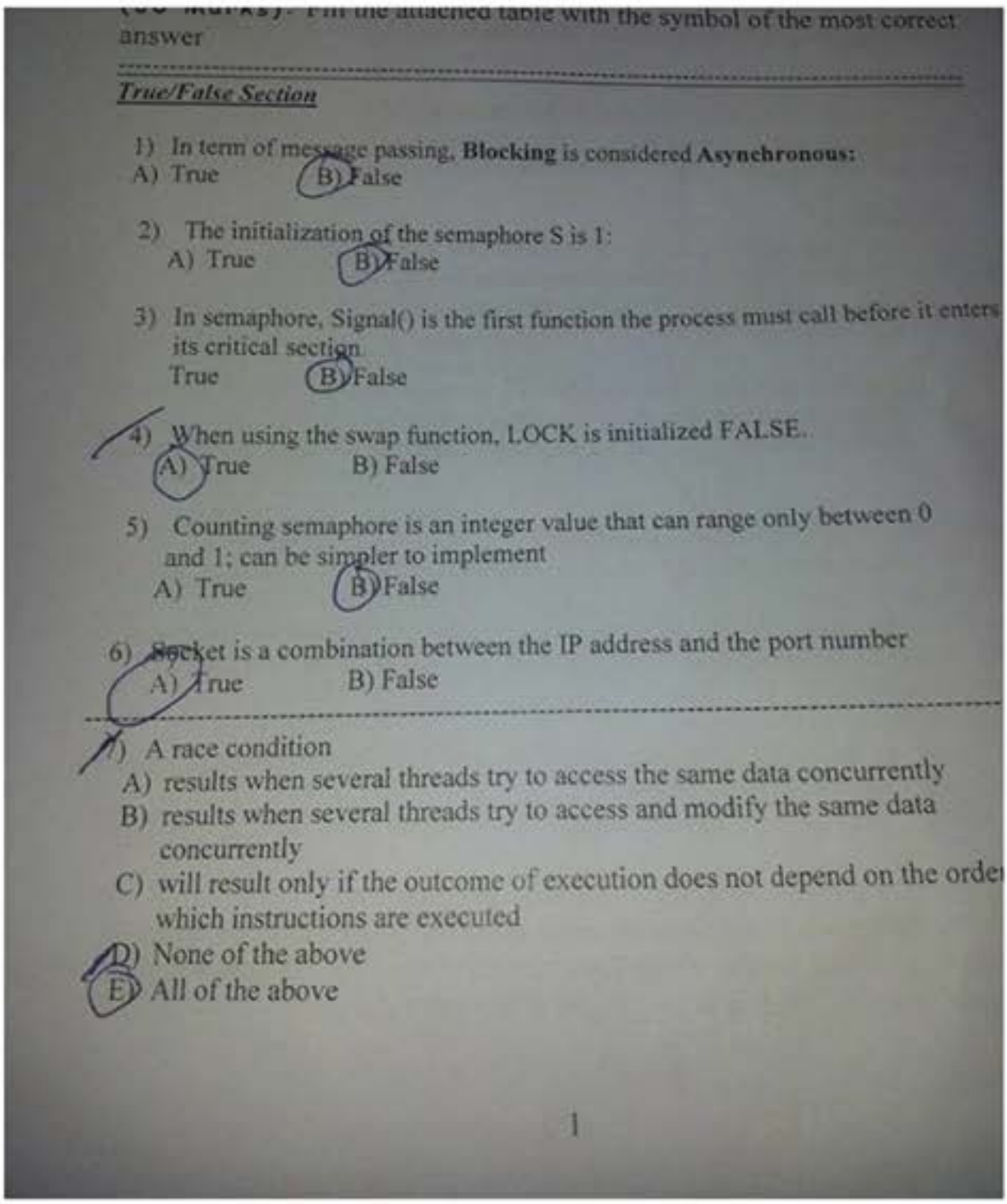
11) In term of signal handling options:
A) Deliver the signal to the thread to which the signal applies
B) Deliver the signal to every thread in the process C) Deliver the signal to certain threads in the process. D) All of the given choices.

12) upcalls is:
A) To make it possible for the user to communicate with the thread.
B) A communication mechanism from the kernel to the thread library.
C) To make it easier for the user to communicate directly with the kernel thread.
D) None of the given choices.

13) The module that gives control of the CPU to the process selected by short-term scheduler and is invoked during every process switch is called ....
A) Long-term scheduler B) Medium-term scheduler C) Dispatcher D) Swapper

14) In term of preemptive CPU scheduling:
A) The process at running state will be finished first before CPU moves to the next process to be executed.
B) It is not necessary that the process at running state will be finished first before CPU moves to the next process to be executed. C) A and B. D) None of the given choices

15) One of the following scheduling algorithms give the minimum average waiting



answer

True/False Section

1) In term of message passing, **Blocking** is considered **Asynchronous:**
A) True B) False

2) The initialization of the semaphore S is 1:
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3) In semaphore, Signal() is the first function the process must call before it enters its critical section
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D) None of the above
E) All of the above

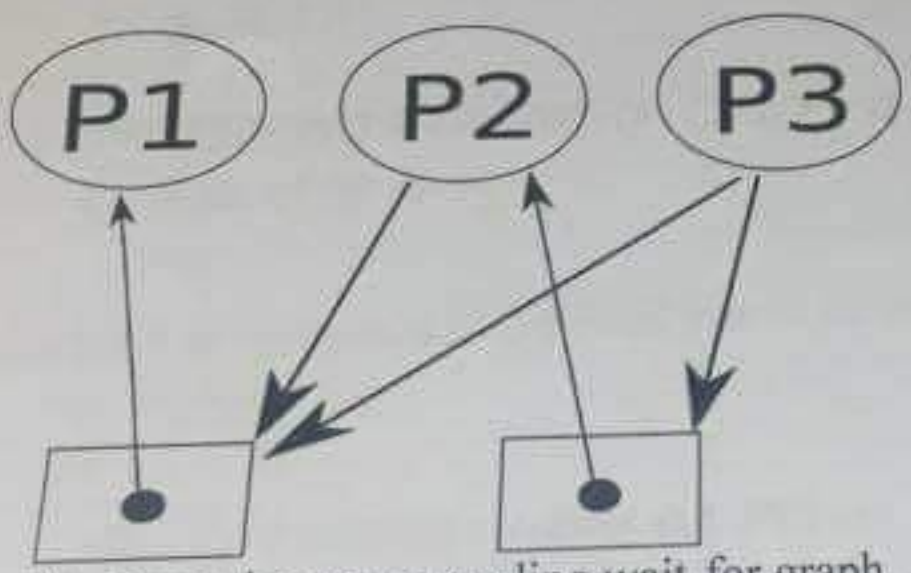
1

Part 2 [19 Marks]

Q1) Identify the conditions that should hold simultaneously so that a deadlock state arises. [4 marks

Q2) How can the system handle deadlock? [3 marks]

Q3) Consider the following resource allocation graph: [3 marks]



1) Draw the corresponding wait-for graph.

2) Is there a deadlock? Why?

10) A process in the waiting state is:
a) Waiting in the ready queue
b) Waiting to be assigned to a processor
c) Waiting for some event to occur
d) All of the above

11) Using Remote Procedure calls, marshalling parameters involves:
a) Packaging parameters to transmit it over network
b) Unpacking Parameters
c) Converting machine dependent data into XDL format
d) A and C

12) A CPU bound process:
a) Spends most time doing computation
b) Spends most time doing I/O
c) Has many short CPU bursts
d) A and C

A set of processes A, B, C and D, are scheduled using preemptive priority scheduling algo
each process, burst time, arrival time and the priority are assigned in the following table.
these values answer the following 6 questions:

Process	Burst Time	Arrival Time	Priority
A	5	0	2
B	3	2	1
C	4	7	3
D	2	9	4

13) The process(es) that has/have a waiting time equals 0 is:
a) A
b) B
c) C
d) A and C
e) B and C

14) The turnaround time of process (A) equals:
a) 2
b) 6
c) 3
d) 7
e) None of the above

15) The last executed process finishes at time:
a) 13
b) 11
c) 12
d) 13
e) 14

16) Processes are scheduled on the CPU in the order:
a) A B C D
b) A B C D C
c) A B A C D
d) A B A C D C
e) None of the above

17) The number of pre-emptions:
a) 0
b) 1
c) 2
d) 3
e) 4

18) CPU is idle at the interval time:
a) 4-5
b) 5-6
c) 6-7
d) 7-8
e) CPU has always a process to execute

19) The necessary conditions needed for the deadlock to occur:
a) No mutual exclusion, hold and wait, pre-emption, circular wait.
b) Mutual exclusion, no hold and wait, pre-emption, circular wait.
c) Mutual exclusion, hold and wait, no pre-emption, circular wait.
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20) Which of the following statements is true?
a) A safe state is a deadlocked state.
b) A safe state may lead to a deadlocked state.
c) An unsafe state is necessarily, and by definition, always a deadlocked state.
d) An unsafe state may lead to a deadlocked state.

21) A deadlock free solution eliminates the possibility of starvation.
a) *True*
b) *False*

9) Which of the following is/are of the advantages of microkernel operating systems?
   a) Extendibility
   b) Portability
   c) Reliability
   d) security
   e) All of the above

10) Passing system call parameters using the following method(s) limits the number of parameters:
   a) Registers
   b) Block
   c) Table
   d) Stack
   e) B and C

Q2) State whether each of the following statements is True or False? [4 pts]

	Statement	T/F
1)	In the vectored interrupts, the interrupt signal includes the identity of the device sending the interrupt	
2)	In the asynchronous I/O method, no simultaneous I/O requests are outstanding at a time.	
3)	FreeBSD UNIX is an example on multitasking operating system	
4)	In a layered approach to OS, each layer use services from only higher levels and provides services for only lower levels.	

Q3) Fill in the blanks: [4 pts]

1) Allowing operating systems to run as applications within another operating systems is called _____.

2) The pieces of code that determine what action should be taken for each type of interrupt ar called _____.

3) The interface to the services provided by the operating systems is called _____

4) The details of the system calls hidden from the programmer using _____.

...If P1 requests additional resources (0, 5, 2) of (A, B, C) resp...
a) The process should wait since the resources are not available.
b) The system will raise an error condition since it exceeds the need of P1.
c) The request could not be granted since it leaves the system in an unsafe state.
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Process	Burst Time	Arrival Time	Priority
A	3	0	2
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C	4	7	3
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15) The process(es) that has/have a waiting time equals 0 is:
a) A b)B c) C d) A and C e) B and C

16) The turnaround time of process (A) equals:
a) 2 b) 6 c)3 d)7 e) None of the given choices

17) The last executed process finishes at time:
a) 15 b)11 c)12 d)13 e)14

18) Processes are scheduled on the CPU in the order:
a) A B C D b) A B C D C c) A B A C D d) A B A C D C e) None of the given cho

19) The number of pre-emptions:
a) 0 b)1 c) 2 d)3 e)4

20) CPU is idle at the interval time:
a) 4-5 b) 5-6 c)6-7 d)7-8 e) CPU has always a process to e

21) The average waiting time for all of the processes equals:
a) 0.75 b)1.00 c)1.25 d) 1.50 e)None of the above

2) The average turnaround time for all of the processes equals:
a) 3.25 b)4.25 c)5.25 d)4.00 e)None of the above

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...e of the benefits of multithreading is to take advantage of multiprocessor architecture and run threads in parallel. This feature is called:

a) Responsiveness.
b) Economy
c) Scalability
d) Resource sharing
e) None of the above

Part B [7 marks]

Q2) Describe Four General Strategies for dealing with deadlock. [2 pts]

Q3) Assume that a deadlock was already detected, how an operating system could recover from this deadlock. [2 pts]

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15) The last executed process finishes at time:
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c) 12
d) 13
e) 14

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a) A B C D
b) A B C D C
c) A B A C D
d) A B A C D C
e) None of the above

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a) 0
b) 1
c) 2
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e) 4

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Prince Hussein Bin Abdullah

Operating Systems **Mark** ----

1st Summer Semester **Final Exam (A)** 40

Tuesday 11/7/2017 **12:45 – 2:45**

Student Name: هسام عوهف بنات البرغوثي **Student Number:** 1331260

Section Number: 3 **Seat Number:**

Mobiles are not allowed. There use is considered cheating and will give you zero in the exam.

Part1. Put X under the choice of the most correct answer in the attached answer sheet. [22Mar

1) The bounded buffer problem is also known as :
   a) Readers – Writers problem b) Dining – Philosophers problem
   c) Producer – Consumer problem d) None of the given choices

2) For non-sharable resources (in term of jobs execution) like a printer, usually, mutual exclusion :
   a) must exist b) must not exist c) may exist d) None of these

3) In term of thread cancelation, which of the following is true?
A) Asynchronous cancellation terminates the target thread immediately
B) Deferred cancellation allows the target thread to periodically check if it should be cancelled
C) A and B. D) None of the given choices.

4) If the process is waiting to be assigned to a processor, then it is in the ..... State
   A) New B) wait C) ready D) B or C E) None of the given choices

5) When ready queue is partitioned into foreground queue and background queue, the **fore**
   uses:
   A) SJF B) FCFS C) Round-robin (RR) D) A and C E) All of the given cho

6) The selection of one process from the ready queue to be executed is called?
   A. Long-term scheduling
   B. Short-term scheduling
   C. Medium-term scheduling
   D. Batching
   E. None of the above

Blocking message passing : Considered Asynchronous

Prince Hussein Bin Abdullah

Operating Systems **Mark** ----

1st Summer Semester **Final Exam (A)** 40

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   C. Medium-term scheduling
   D. Batching
   E. None of the above

Blocking message passing : Considered Asynchronous

Describe two switching states that result in preemptive scheduling. [2 pts]

Q6) Given the five processes below with their indicated CPU time units, answer the questions below. Assume that processes arrived in the order A, B, C, D, E at time 0. [6 pts]

Process	CPU Time
A	7
B	1
C	2
D	5
E	3

a) Indicate the average waiting time under First-Come-First-Served (FCFS) scheduling. [1pt]

b) Indicate the average Turnaround time under Shortest Job First (SJF) scheduling. [1pt]

c) Show the scheduling order for these processes under First-Come-First-Served (FCFS) scheduling. [1pt]

d) Show the scheduling order for these processes under Shortest Job First (SJF) scheduling. [

e) When the processes may suffer from Convoy effect under FCFS or Under SJF? Why? [2 pt

as?

A. I/O –bound
B. Device-bound
C. CPU-bound
D. Time-sharing process

None of the above

9) The Job queue contains:

A. set of all processes in the system
B. set of process that are waiting for execution
C. Set of processes that wait for I/O
D. A and C

According to the following resource allocation table. Use Bankers algorithm to answer the follo questions:

Process	Allocated			Max		
	A	B	C	A	B	C
P0	0	0	1	0	0	1
P1	1	0	0	1	7	5
P2	1	3	5	2	3	5
P3	0	6	3	0	6	5
Available	1	5	2			

10) The total number of instances of type (A, B, C) respectively are:

a) (3, 14, 11)
b) (6, 24, 27)
c) (3, 16, 16)
d) (4, 21, 18)
e) None of the above

11) What is the content of the Need matrix for process P1?

a) (2, 7, 5)
b) (3, 7, 5)
c) (1, 7, 5)
d) (3, 12, 7)
e) None of the above

12) The system is in an unsafe state.

a) True
b) false

13) Which of the following is/are safe sequence(s)?

a) <P3, P2, P1, P0>
b) <P0, P2, P1, P3>
c) <P2, P1, P0, P3>
d) All of the above

...values answer the following 6 questions:

Process	Burst Time	Arrival Time	Priority
A	3	0	2
B	3	2	1
C	4	7	3
D	2	9	4

31) The process(es) that has/have a weighting time equals 0 is:
a) A b)B c) C d)A and C e) B and C

32) The turnaround time of process (A) equals:
a) 2 b)6 c)3 d)7 e)None of the given choices

33) The last executed process finishes at time:
a) 15 b)11 c)12 d)13 e)14

34) Processes are scheduled on the CPU in the order:
a) A B C D b)A B C D C c)A B A C D d)A B A C D C e)None of the gi

35) The number of preemptions:
a) 0 b)1 c)2 d)3 e)4

36) CPU is idle at the interval time:
a) 4-5 b) 5-6 c)6-7 d)7-8 e) CPU has always a process to execut

37) The average waiting time for all of the processes equals:
a) 0.75 b)1.00 c)1.25 d)1.50 e) None of the given choices

38) The average turnaround time for all of the processes equals:
a) 3.25 b) 4.25 c) 5.25 d) 4.00 e) None of the given choices

39) Which of the following is/are affected by a scheduling algorithm?
a) Execution time b) I/O time c) Waiting time
d) All of the above e) A and B

0) The lowest priority process may suffer from:
a) Convoy effect b) Starvation c) Aging d) All of the given choices e) B and C

Number:

24) Which of the following is/are safe sequence(s)?

a) <P3, P2, P1, P0> b)<P0, P2, P1, P3> c)<P2, P1, P0, P3>

d) All of the above e) There is no safe sequence

25) If P1 requests additional resources (0, 5, 2) of (A, B, C) respectively. Then:

a) The process should wait since the resources are not available.

b) The system will raise an error condition since it exceeds the need of P1.

c) The request could not be granted since it leaves the system in an unsafe state.

d) The request could be granted since it leaves the system in a safe state.

26) If P0 requests additional resources (1, 1, 1) of (A, B, C) respectively. Then:

a) The process should wait since the resources are not available.

b) The system will raise an error condition since the request exceeds the need of P1.

c) The request could not be granted since it leaves the system in an unsafe state.

d) The request could be granted since it leaves the system in a safe state.

27) What is the content of the Allocation matrix for process P1 after claiming that the reque
2) would be granted to P1?

a) (1, 5, 2) b) (0, 2, 3) c) (1, 0, 0) d) None of the above

28) Which of the following statements is true?

a) A safe state is a deadlocked state.

b) A safe state may lead to a deadlocked state.

c) An unsafe state is necessarily, and by definition, always a deadlocked state.

d) An unsafe state may lead to a deadlocked state.

29) A deadlock-free solution eliminates the possibility of starvation.

a) True b) False

30) The necessary conditions needed for the deadlock to occur:

a) No mutual exclusion, hold and wait, pre-emption, circular wait.

b) Mutual exclusion, no hold and wait, pre-emption, circular wait.

c) Mutual exclusion, hold and wait, no pre-emption, circular wait.

d) Mutual exclusion, hold and wait, pre-emption, no circular wait.