Heaven's Light is our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 3rd Year 6th Semester Examination, 2015

Department of Computer Science & Engineering

Course No. CSE 601 Course Title: Operating System

Full Marks: 70 Time: THREE (03) hours

N.B:

Answer SIX questions taking THREE from each section

The questions are of equal value

Use separate answer script for each section.

SECTION A

Q.1(a) What is an operating system? Distinguish between the client-server and peer-to-peer models of distributed systems. **Marks 04**

(b) Give the reasons why are caches useful? What problems do they solve? What problem do they cause with multiprocessor system? **04**

(c) What are the differences between multi programming and multi tasking? Explain multi tasking with a suitable example **03⅔**

Q.2(a) Consider the following set of processes with their arrival and CPU burst time: [time in millisecond] **09**

Processes	Arrival Time	Burst Time
P_1	0	17
P_2	1	5
P_3	2	4
P_4	3	3
P_5	4	7

(i) Draw the Grantt Charts that illustrate the execution of these processes using the Preemptive SJF, RR (time slice = 4ms) scheduling algorithms.

(ii) Compute the average waiting time for each of the above algorithms.

(b) What is called Starvation? What treatment could be applied to mitigate the Starvation problem? **02⅔**

Q.3(a) Describe the actions taken by a kernel to context switch between processes. **03**

(b) Define the semaphore variable in an operating system. Describe with appropriate code to solve "Producer Consumer" problem using binary semaphore. **06**

(c) Define the term "monitor" for critical section management.

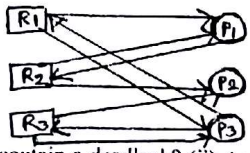
Q.4(a) Consider the following snapshot of a system: **02⅔ 06⅔**

Processes	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Answer the following questions using the Banker's algorithm.

(i) What is the content of the 'Need' matrix? (ii) Is the system in safe state? and (iii) If a request from process P_1 arrives for (0, 4, 2, 0), can the request be granted immediately?

(b) Consider the following resource allocation graph: (R stands for resource and P for process) **05**



(i) Does the above resource allocation graph contain a deadlock? (ii) Assume that R_1 has now three instances? Does this allocation graph now contain a deadlock?

SECTION B

Q.5(a) Distinguish between the following terms: (i) logical and physical address (ii) Internal and external fragmentation and (iii) paging and segmentation. **03**

(b) Given memory partitions of 100KB, 500KB, 200KB, 300KB and 600KB (in order) how would each of the first-fit, best-fit and worst-fit algorithms place processes of 212KB, 417KB, 112KB, and 426KB (in order)? Which algorithm makes the most efficient use of memory? **03**

(c) Consider the following segment table: **05⅔**

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses? (i) 430 (ii) 110 (iii) 2500 (iv) 3400 and (v) 4112.

Q.6(a) What are the basic concepts of the following terms: (i) virtual memory (ii) page fault and (iii) lazy swapper? **03**

(b) Consider the following page reference string: 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1. How many page faults would occur for the following page replacement algorithms? Which one would be better? (i) LRU and (ii) Optimal page replacement. **04⅔**

(c) Consider the paging system with the page table (1 level) stored in memory. **04**

(i) If a memory reference takes 200ns, how long does a paged memory reference take?

(ii) If we add associative registers (TLB for example) and 75% of all page table references are found there, what is the effective memory reference time?

Q.7(a) Define the following terms: (i) dispatcher (ii) context switch and (iii) long-term scheduler. **03**

(b) Show the CPU switching from one process to another with a diagram. **04**

(c) Define the process state and PCB. Show the current activity or states of a process through a diagram. **04⅓**

Q.8(a) Define the Dining Philosopher problem. Solve Dining Philosopher problem with semaphore variables. **05**

(b) Describe the modes of communication for message passing system in inter process communication. **04**

(c) Differentiate between process and program. Describe the process state diagram for running multiple processes at the same time. **02⅔**

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B.Sc. Eng[illegible]ering 3rd Year 6th Semester [illegible]amination, 2014
Dep[illegible]ment of Computer Science [illegible]Engineering
Course [illegible], CSE 601 Course Title: [illegible]erating System
[illegible] Marks: 70 Time: THREE [illegible] hour

N.B:

Answer **SIX** questions taking **THREE** fro[illegible] each section.
The questions are of equal value.
Use separate answer script for each section.

SECTION A

		Marks
Q.1(a)	What is an Operating System? Why is it so important in comp[illegible]ter system?	03
(b)	Define the essential properties of the following types of opera[illegible]ng system: (i) Batch (ii) Interactive (iii) Time-Sharing and (iv) Distributed.	06
(c)	What is caching? When is it useful?	
Q.2(a)	Describe the actions taken by a kernel to context switch between proce[illegible]ss.	02½
(b)	Explain the various scheduling criteria in evaluating scheduling algorithm.	04
(c)	Describe the producer-consumer problem.	03½
Q.3(a)	What are the different types of multiprocessing?	04
(b)	How can a user program disrupt the normal operation of a system?	03
(c)	Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time.	02½ 06

Process	Arrival Time	Burst Time
1	0	8
2	1	4
3	2	9
4	3	5

Then find the average waiting time when the following algorithms are applied-
(i) FCFS (ii) Preemptive shortest job first and (iii) Round robin with quantum = 4.

Q.4(a)	What is deadlock? What are the necessary conditions for deadlock?	03½
(b)	Consider the following snapshot of a system:	06

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	1	0	7	5	3	3	3	2
P_1	2	0	0	3	2	2			
P_2	3	0	2	9	0	2			
P_3	2	1	1	2	2	2			
P_4	0	0	2	4	3	3			

Answer the following queries using Banker's algorithm-
(i) What is the content of matrix need? And (ii) Is the system in a safe state?

(c)	What are methods used to recover from deadlock?	02

SECTION B

Q.5(a)	What is demand pagging?	
(b)	Define (i) logical address space and (ii) physical address space.	02
(c)	How an external and an internal fragmentation can be removed. Explain with examples.	02
(d)	Consider a logical address space of 32 pages of 2048 words each, mapped onto a physical memory of 8 frames. Then answer the following questions: (i) How many bits are needed for addressing the total logical space address? (ii) How many bits are needed to indicate page number? And (iii) How many bits are needed for addressing the physical address?	04½ 03
Q.6(a)	Define paging? Explain the basic method for implementing paging with an example.	
(b)	Point out the need for page replacement. Explain FIFO, LRU and optimal page replacement algorithms with an example.	04 07½
Q.7(a)	Define the term critical section and explain how semaphore is used to solve synchronization problem?	04
(b)	Assume two processes A (counter++) and B (counter--):	04

```
A:                      B:
reg1 = counter          reg2 = counter
reg1 = reg1+1           reg2 = reg2+1
counter = reg1          counter = reg2
```

Show a computation sequence to illustrate how race condition may happen.

(c)	What is process control block? Explain.	
Q.8(a)	What are the functions of fork () and exec ()?	03½
(b)	Explain the address translation mechanism used in segmentation.	02½
(c)	Describe the different types of directory structures.	05
		04

Heaven's light is our guide

Rajshahi University of Engineering & Technology
B.Sc. Engineering 3rd year 6th Semester Examination, 2013
Department of Computer Science & Engineering
Course No: **CSE 601** Course Title: **Operating System**
Full marks: 70 Time: Three (03) hours

N.B. Answer six questions, taking three from each section.
The questions are of equal value.
Use separate answer script for each section.

SECTION-A

Q1. (a) Explain the various scheduling criteria in evaluating scheduling algorithms. 2 2/3

(b) Consider the following table: 9

Processes	Brust time	Priority
P1	20	4
P2	5	2
P3	6	1
P4	1	3

(i) Draw Gantt charts showing of these process execution using FCFS, SJF, priority and RR (time slice = 4) scheduling algorithms.

(ii) Compute the turn around time and average waiting time for each of the above algorithms.

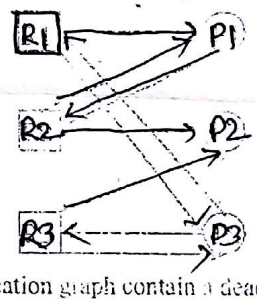
Q2. (a) Which types of system is most user friendly among all systems (Batch to Handheld)? Explain briefly. 4

(b) Explain the dual mode operation. 1 2/3

(c) What are the semaphores? Explain two primitive semaphore operations. 4

Q3. (a) What is deadlock? What are the necessary conditions for deadlock? 2 2/3

(b) Consider the following resource allocation graph: 9



(i) Does the above allocation graph contain a deadlock?

(ii) Assume that R1 has now three instance? Does this allocation graph now contain a deadlock?

(iii) If it is not deadlock free, how can we make it deadlock free?

Q4. (a) Consider the following snapshot of a system: 5

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Answer the following questions using the Banker's algorithm:

(i) What is the content of the matrix need?

(ii) Is the system in a safe state?

(b) Write down the benefits of multiprogramming? 3 2/3

(c) System calls are part of most modern operating systems. 3

(i) What is the purpose of a system call?

(ii) What mechanism is typically used to implement system call?

SECTION-B

Q5. (a) Consider a paging system with the page table stored in memory and TLB is used with page tables. If memory access takes 200ns, access memory for page table and frame number takes 200ns and TLB takes 10ns, then find the effective memory reference time for (i) 90 percent and (ii) 96 percent hit ratio. 4

(b) Define the essential properties of the real-time operating system. 3 2/3

(c) What is kernel? What are the benefits of micro-kernel approach? 4

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B.Sc. ... ngineering 3... Year 6th Semester Examination, 2012
... partment of ... mputer Science and Engineering
Course No. CSE ... Course Title: Operating System
Full Mark... 0 Time: THREE (03) hours

N.B.
Answer SIX questions taking THREE from ... section.
The questions are of equal valu...
Use separate answer script for ... ch section.

SECTION A

Marks

1. (a) There are many computer s...tems (Batch ... handheld). Every computer system h... its own functionalities, which is completely differe...t or relates to ...h other's. User is one of the most vital parts of these systems. According to the system pr...perties and u... requirements we need different operating system to operate a computer.
   a) What is an operating system? Is i... cessary for all systems? 04
   b) Which types of sy...tem is most us... friendly among all systems? Explain b...fly. 05
   c) What are the differences between ...rap and an interrupt? 02½
   (b) After the hardware, operating system is th... key concern to bring computer useab... Performance or speed of a computer system not only depend... hardware but also depend how eff...tively one design the operating system. A deve...per has to de...ct all the parts of the sy...tem bef... coding. Day by day application program are c...anging dramatic...lly. So it is ...eally difficul... desi... and modify a simple system. That's why moder... computer system...s are based on layered struct...re and ...rnel.
   a) What is kernel? H...w can we evade pressure from kernel? 02
   b) Which communic...ion model you want to implement in your sy...em? 04
   c) Modern computer system prefers lay...er approach. why? 04
   d) What are the main advantages of multiprogramming? 01½
   (c) What are semaphores? E...xplain two primitive semaphore operation... 02½
   (d) Consider the following set ...f process: 09

Process	Arrival Time	Burst Time
P_1	0	8
P_2	1	4
P_3	2	9
P_4	3	5

   i). Draw Gantt charts ...owing the execution of these processes usi... FCFS, ...F and RR (quantum=1) scheduling schemes
   ii). Compute the turn around time and average waiting time for each ... the abo... scheduling algorithms.
   iii). Which scheduling algorithm is best? Justify in favour of your ans...
   (a) What is dispatcher? What is dispatch latency? 03
   (b) Consider the following segment table: 04½

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?
i) 0, 430 ii) 2, 500 iii) 0, 532 iv) 3, 551 v) 4, 102 and vi) 1, 18
(c) Given five memory partitions of 100KB, 500KB, 200KB, 300KB and 60...KB (in ...der), how would each of the first-fit, best-fit and worst-fit algorithms place process of 012KB, 417KB, 112KB and 426KB (in order)? Which algorithm makes the most efficient use of the memory? 04

SECTION B

2. (a) What is role of PCB? List the attributes of PCB. 03½
   (b) Assume that a system consists of four resources of same type shared by three processes, each of which needs almost two resources. Show that the system is deadlock free. 04
   (c) Define fragmentation and its types with example. 04
   (d) Draw the labeled diagram for the process state transitions. 03
   (e) Draw the paging hardware diagram. Write the working procedure of paging hardware in details 04½
   (f) Compare (i) Paging and ...gmentation and (ii) Logical address space and Physical address space 04
   (g) It is known that multiprogramming means to run multiple jobs simultaneously and it is faster than the sequential execution. Suppose two jobs each of which needs 10 minutes of CPU time starts simultaneously with 50% I/O waiting time. then find the time of execution will it take
   i). if both jobs run sequentially? 06
   ii). if both jobs simultaneously?
   (h) Consider a logical address space of eight pages of 1024 addressable words each mapped onto a physical memory of 32 frames, find ... 05½
   i) The ... bits in logical address.
   ii) The ... bits in physical address.
   (i) What is meant by contex... switch? What are the benefits of multithreaded programming? 03½
   (j) What is ... compution? How does one compare the effective access time for a demand paging system? 04
   (k) With a figure describe what does operating system do after occurring page fault. 04

Q6. (a) Operating system need to be ...le to prevent applications from crashing or locking up the ... 3 2/3
system or from interfacing wi... other applications. Which three kinds of hardware support
do we required to accomplish ...is? Justify your answer.

(b) If a process creates several ...w processes then what the possibilities exist in terms of 4
execution and address space c...new processes.

(c) What are the main advantages ...f layered approach? 2

Q7. (a) What are the two main functi...s of the directory services? 2 2/3

(b) Consider the following segme...t table → P 6

Segment	Base	Length
0	100	11
1	2570	5
2	99	60
3	49	56

What are the physical addres...of :
(i) 0, 121 (ii) 1, 800 (iii) 3, 4 (iv) 2,2

(c) What is context switching? ...rite the importance of context switching. 3

Q8. (a) What is the cause of thrashi...? How does the system detect thrashing? 4

(b) What is the purpose of the c...mmand interpreter? Why is it usually separate from the 3 2/3
kernel?

(c) Modern computer system p...fer layered approach. Why? 4

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CSE 601 CT-1 TIME: 25MINS

Q.1 Distinguish between multiprocessor and multiprogramming system. 5

Q.2 How time-sharing system provides user interaction? 5

Q.3 What is cache coherency and consistency? 5

Q.4 Design a distributed network and define its properties. 5

COURSE CODE-CSE 601

CT-2

what are the significance of base and limit registers in case of hardware protection? 5

2 what are the major activities of an OS in regard to process management and file management? 5

3 Writing an OS that can operate without interference from malicious or undebugged user programs requires hardware assistance. ame three hardware aids for writing an OS and describe how they could be used together to protect the OS? 8

CSE-601

CT-3

.1 Consider the following process table with the burst time given in milliseconds:

rocess	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time 0. Draw Gantt charts illustrating the execution of these processes using FCFS, preemptive SJF, priority (smaller number implies higher priority) and RR (quantum=1) scheduling. Also calculate the turnaround time and response time of each process and average waiting time in each case.

Q: 1 CO1&2

COURSE CODE-CSE 601

CT-4

Q.1 Draw a Resource-Allocation graph and the corresponding Wait-for graph for the following criteria: 3+3+4
P={P1, P2, P3, P4 }, R={R1, R2 } E={P1->R1,R1->P2, R1->P3, P3->R2,R2->P4,R2->P1}. Identify whether there exists a deadlock here or not

Q.2 It is claimed that the system is currently in a safe state. Find out the safety sequence. 6+4

	Allocation	*Ma x*	*Available*
	A B C	*A B C*	*A B C*
Po	**010**	**753**	**332**
PI	**200**	**322**	
p2	**302**	**902**	
P3	**211**	**2 2 2**	
P4	**0 0 2**	**433**	

Suppose now that process PI requests one additional instance of resource type *A* and two instances of resource type C, which is *Request*= (1,0,2). Can the request be granted?

$P = (P_1, P_2, P_3, P_4, P_5)$

$R_1 = \{R_1, R_2, R_3, R_4, R_5\}$

$E = \{P_1 \to R_1, R_1 \to P_2, P_2 \to R_3,$
$R_3 \to P_5, P_2 \to R_4, R_4 \to P_3.$
$P_3 \to R_5, P_2 \to R_5, R_5 \to P_4,$
$P_4 - R_2, R_2 - P_1\}$

$P_i \longrightarrow R_1$

$\downarrow$

P_j

$P_i \to P_j$