OPERATING SYSTEM WITH LINUX
(CSEN 3107)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Which is the inner most layer close to the hardware to get things done?
(a) System program (b) Shell
(c) Kernel (d) System call.

(ii) CPU fetches the instruction from memory according to the value of
(a) program status word (b) instruction register
(c) program counter (d) status register

(iii) Using which of the following command can hidden files be viewed?
(a) ls –l (b) ls –a (c) ls –h (d) ls -k.

(iv) Scheduling a process from ready queue to CPU is done by
(a) short term scheduler (b) long term scheduler
(c) middle term scheduler (d) dispatcher.

(v) In UNIX, the return value of fork system call to parent and child are
(a) a negative integer, zero (b) zero, a negative integer
(c) zero, a nonzero integer (d) process id of child and zero

(vi) Which of the following is not a condition that causes deadlock?
(a) Mutual Exclusion (b) Pre-emption
(c) Hold and wait (d) Circular wait.

(vii) A state is safe, if
(a) the system does not crash due to deadlock occurrence
(b) the system can allocate resources to each process in some order and still avoid a deadlock
(c) the state keeps the system protected and safe
(d) all of these.

(viii) Storing only non-empty entries as access rights for objects is known as
(a) capability list (b) access matrix
(c) ACL (d) all of the above.

(ix) Which of the following is hidden inside useful programs and gets activated when the program containing them is executed
(a) logic bomb (b) Trojan horse
(c) backdoor (d) virus

(x) When an intruder pretends to be a valid host in a communication, by breaching the authentication and then gains access for which they are not entitled it is called
(a) spoofing (b) DoS
(c) Man-in-middle attack (d) none.

Fill in the blanks with the correct word

(xi) A problem encountered in multitasking when a process is perpetually denied necessary resources is called _____.

(xii) Semaphore is a/an _____ to solve the critical section problem.

(xiii) If time quantum is too large RR scheduling suffers from _____.

(xiv) The OS running on virtual machine is sometimes called guest OS is known as _____.

(xv) _____ virus is designed such that it tries to hide itself entirely from any detection.

Group - B

2. (a) Explain the difference between multiprocessing, multiprogramming, multi-user and multitasking OS. *[(CO1)(Remember/LOCQ)]*
(b) Explain how a multiprogramming operating system increases CPU utilization. *[(CO1)(Analyze/IOCQ)]*
(c) Write short note on Virtual Machine. *[(CO1)(Remember/LOCQ)]*

6 + 3 + 3 = 12

3. (a) Explain the Unix OS architecture with a diagram. *[(CO5)(Analyse/IOCQ)]*
(b) Explain the Linux OS architecture. *[(CO5)(Remember/HOCQ)]*
(c) Describe 5 File management system calls in the Linux operating system. *[(CO5)(Remember/IOCQ)]*

7 + 2 + 3 = 12

Group - C

4. (a) What is PCB? What are the different information stored in PCB? *[(CO2)(Analyse/LOCQ)]*
(b) What is context switching? Explain the role of different queues used in process management. *[(CO2)(Explain/IOCQ)]*
(c) Write different techniques to create a new process. *[(CO2)(Remember/LOCQ)]*

(1 + 4) + (2 + 2) + 3 = 12

5. (a) Consider the following set of processes, with the length of the CPU burst time given in millisecond.

Process	Arrival Time	Burst Time	Priority
P1	0	10	5
P2	2	6	1
P3	3	3	3
P4	5	9	4
P5	6	7	2

Draw a Gantt chart. Illustrate the execution of these processes in pre-emptive priority (higher number implies a higher priority) scheduling. Find the completion time and response time.
Find the average waiting time and average turnaround time. *[(CO2)(Apply/LOCQ)]*

(b) Compare all non pre-emptive algorithms. *[(CO2)(Remember/LOCQ)]*

(c) What are I/O burst and CPU burst? How do they affect the performance of multiprogramming? *[(CO2)(Apply/IOCQ)]*

5 + 3 + (2 + 2) = 12

Group - D

6. (a) At a particular time of computation the value of a counting semaphore is 7. Then 15 P operations and 10 V operations were completed on this semaphore. Find out the resulting value of the semaphore. *[(CO3)(Remeber/LOCQ)]*

(b) What do you mean by race condition? Explain with example. What are the different criteria for critical section algorithm? Define all of them. *[(CO3)(Remember/LOCQ)]*

2 + (2 + 2 + 6) = 12

7. (a) Consider a system with the following information. Determine if the system is in deadlock situation.

R1	R2	R3
5	6	4

Process	Max			Allocation		
	R1	R2	R3	R1	R2	R3
P1	1	0	2	4	2	0
P2	1	1	0	1	0	0
P3	1	1	0	0	1	3
P4	0	2	1	0	0	0
P5	1	2	0	1	0	1

[(CO4)(Analyse/LOCQ)]

(b) If P4 requests one instance of resource type R2, find out whether the system is in deadlock state. *[(CO4)(Analyse/IOCQ)]*

(c) What is the difference between starvation and deadlock? What is a claim edge in RAG? *[(CO4)(Remember/LOCQ)]*

3 + 3 + (4 + 2) = 12

Group - E

8. (a) What is Access matrix? What type of operation can be done on it?

[(CO6)(Analyse/LOCQ)]

(b) What are the 3 components of Access control model? Describe each of them.

[(CO6)(Remember/LOCQ)]

(c)

Domain/Object	File A	File B	File C	Printer
Domain1	read control		write	print
Domain 2	read, write		read*	
Domain 3		read, write, execute	read	print

For this above access matrix reduce it to access list and capability list. Among these three which is most efficient from implementation view point?

[(CO6)(Apply/IOCQ)]

3 + 3 + (3 + 3) = 12

9. (a) Write the system protection mechanism of the Linux operating system.

[(CO6)(Analyse/IOCQ)]

(b) Access matrix, access list and C-list are three types of protection. Explain which is the most efficient from implementation view point. *[(CO6)(Remember/LOCQ)]*

(c) Differentiate between Logic bomb, Trojan horse and a Virus. What is malware?

[(CO6)(Remember/LOCQ)]

4 + 3 + (3 + 2) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	62.5	35.4	2.1