MCA-301

OPERATING SYSTEM AND SYSTEMS SOFTWARE

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer all questions. $10 \times 1 = 10$

(i) Banker's algorithm for resource allocation deals with

(A) deadlock prevention (B) deadlock avoidance
(C) deadlock recovery (D) mutual exclusion

(ii) In context of Operating System, RPC stands for:

(A) remote procedure calls (B) random procedure calls
(C) repeated process calls (D) remote program calls

(iii) Page fault occurs when:

(A) the page is corrupted by application software
(B) the page is in main memory
(C) the page is not in main memory
(D) none

(iv) If a process is in BLOCKED state waiting for I/O service then after completion of the service it will go to the:

(A) TERMINATED state (B) NEW state
(C) READY state (D) none of these

(v) CPU performance is measured through:

(A) flaps (B) throughput

(C) turnaround time (D) none of these

(vi) The time spent by a process in the ready queue is:

(A) waiting time (B) response time

(C) throughput (D) none of these

(vii) Which one of the following process states is not a valid process state?

(A) blocked (B) load

(C) running (D) none of these

(viii) The scheduler, which selects jobs from the pool of jobs and loads them to the ready queue is:

(A) long term scheduler (B) medium term scheduler

(C) short term scheduler (D) none of these

(ix) Which one of the following is not page replacement algorithm?

(A) LRU replacement (B) optimal replacement

(C) process replacement (D) none of these

(x) In which of the following scheduling policies context switching will never take place:

(A) round robin

(B) first cum-first served

(C) pre-emptive

(D) shortest remaining time next (SRTN)

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Differentiate between process and thread. In which environment thread works optimally? 3+2

3. What do you mean by 'processor affinity' and 'pull migration'? What is 'degree of multiprogramming'? 2+2+1

4. What is critical section problem? What are the requirements that the solution to critical section problem must satisfy? 2+3

5. Worse fit performs better in variable partitioning – why? 3+2
Consider a logical address space of 8 page of 1024 words, each mapped onto a physical memory of 32 frames. How many bits are required to represent the logical and physical addresses?

6. A system has four processes P1 through P4 and two resource types R1 and R2. It has 2 units of R1 and 3 units of R2. Given that:
P1 requests 2 units of R2 and 1 unit of R1
P2 holds 2 units of R1 and 1 unit of R2
P3 holds 1 unit of R2
P4 requests 1 unit of R1
Show the resource graph for this state of the system. Is the system in deadlock, and if so, which processes are involved?

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) How we can predict the length of the next CPU burst in case of Shortest Job First Algorithm? 3
(b) Discuss about Multilevel feedback Queue Scheduling. 2
(c) Consider the following process with the length of CPU burst time. 5+5

Process	Burst Time	Arrival time	Priority
P1	10	0	3
P2	1	1	1
P3	2	3	3
P4	1	6	4
P5	5	8	2

draw Gnatt charts, illustrating the execution of these processes using:
(a) Preemptive SJF
(b) Priority Scheduling
Also find out average waiting time in all the cases.

8. (a) Consider a system with 5 processes P0 to P4 and three resource types A,B,C. Resource types A has 7 instances, B has 2 and C has 6 instances. Suppose at time T0 we have following snapshot: (2+3+1)+1 +(2+3+3)

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	0	0
P1	2	0	0	2	0	2			
P2	3	0	3	0	0	0			
P3	2	1	1	1	0	0			
P4	0	0	2	0	0	2			

Answer the following questions with Banker's algorithm:

(i) What is the content of matrix need?

(ii) Is given system in deadlock state?

(iii) Suppose P2 makes an additional request (0, 0, 1). What will be the effect of this request to the system?

(b) What is deadlock? Compare and contrast Deadlock Prevention and Deadlock Avoidance. Write about how to recover if deadlock occurs.

(c) What is thrashing?

9. (a) Consider the following page reference during a given time interval for a memory consisting of 5 frames: y, c, z, c, d, a, y, a, e, a, y, f, d, e using the 5

(i) FIFO replacement strategy

(ii) LRU replacement strategy.

Compare the result

(b) A computer whose processes have 512 pages in their address space keeps its page tables in memory. The overhead required for reading a word from page table is 50nsec. To reduce this overhead the computer has TLB that holds 32 entries and can do look ups in 5nsec. What hit rate is needed to reduce the mean overhead 20nsec? 3

(c) Describe the actions taken by the OS when a page fault occurs. 3

(d) Given memory partitions of 100K, 500K, 200K, 300K and 600K (in order). How would each of the first-fit, best-fit and worst-fit algorithms place processes of 212K, 417K, 112K and 426K (in order)? Which algorithm makes most efficient use of memory? 4

10.(a) Which problem of one pass assembler motivated the design of two-pass assembler? 3+2+6+2+2

(b) What are functions of loader?

(c) What are phases of compilation? Explain functionality of each phase with example.

(d) What is cross compiler? What is linking?

11.(a) What is Belady's anomaly? Why does it occur in case of one page replacement algorithm? 4+3+5+3

(b) How can access matrix be implemented?

(c) Briefly describe indexed file allocation technique. Compare with linked file allocation.

(d) What are different disk scheduling algorithm? Mention at least four of them.