MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

IT-503

OPERATING SYSTEM

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.
All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. 10×1 = 10

(i) With a segmentation, if there are 64 segments, and the maximum segment size is 512 words, the length of the logical address in bits is
(A) 12 (B) 14 (C) 15 (D) 16

(ii) Which of the following statements is false?
(A) segmentation suffers from external fragmentation
(B) paging suffers from internal fragmentation
(C) segmented memory cab be paged
(D) virtual memory is used only in muti-user systems

(iii) The full form of SPOOL is
(A) shared processor object oriented language
(B) special purpose object oriented language
(C) simultaneous peripheral operations online
(D) none of these

(iv) An address generated by the CPU is commonly referred to as
(A) logical address (B) physical address
(C) relational address (D) virtual address

(v) Throughput is
(A) number of processes competed per unit time
(B) completion time of the whole process
(C) time for waiting in ready queue
(D) time waiting to get into the memory

(vi) A system program that sets up an executable program in main memory ready for execution
(A) assembler (B) linker (C) loader (D) text editor

(vii) Mutual exclusion problem occurs between
(A) two adjacent processes that do not interact
(B) processes that share resources
(C) processes that do not use the same resources
(D) none of these

(viii) In which of the following scheduling policies does context switching never take place?
(A) Round Robin (B) Shortest Job First
(C) Pre-emptive (D) First Come First Serve

(ix) 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) one tries to divide a number by zero

(x) Safety algorithm may require an order of _____ operations to determine whether a state is safe (where, m is the number of resource type and n is the number of processes).
(A) $m \times n^2$ (B) $m \times n$
(C) $m^2 \times n$ (D) none of these

GROUP B
(Short Answer Type Questions)

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

2. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds. The processes are assumed to have arrived in the order as shown below: Draw four Gantt chart for SRTF (shortest remaining time first) scheduling with time quantum = 5. 5

Process	Arrival time	CPU Time
P1	0	13
P2	2	6
P3	3	10
P4	5	8

3. (a) What are the necessary conditions for deadlock? 2+3

(b) Write short note on Kernel Level Thread.

4. What is Process Control Block? Discuss the structure of Process Control Block. 1+4

5. (a) Mention one characteristic each of Time Sharing System and Batch Processing System. 2+3

(b) What are the advantages and disadvantages of having unequal size partitions in fixed partition scheme?

6. What is deadlock? Critically comment on the following topic: Cycle in resource allocation graph does not always imply the occurrence of deadlock. 2+3

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GROUP C
(Long Answer Type Questions)

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

7. (a) What are overlays? 2
(b) What are the advantages of segmentation over paging? 2
(c) Explain the difference between internal fragmentation and external fragmentation. Which one occurs in paging system? How can the problem of external fragmentation be solved? 7
(d) Why are segmentation and paging sometimes combined into one scheme? 2
(e) State the advantages and disadvantages of single contiguous memory allocation. 2

8. Given memory partition 100k, 500k, 200k, 300k and 600k (in order), how would each of the First-fit, Best-fit, Worst fit algorithm place processes of 212k, 417k, 112k, and 426k? Which algorithm makes the most efficient use of memory? Why is page size always power of 2? What is a multilevel paging? What is DMA? How does DMA increase system concurrency?

9. Consider the following pace reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 6, 6, 2, 1, 2, 3, 6. How many page faults would occur for the following replacement algorithms, assuming four frames. LRU replacement, FIFO replacement, Optimal replacement. The list of all passwords is kept within the operating system. Thus, if a user manages to read this list password protection is no longer provided. Suggest a scheme that will avoid this problem. What is Thrashing? What is the cause of Thrashing? What is Swap-In and Swap-Out? 6+3+2+2+2

10. What do you mean by race condition? What is semaphore? What is counting semaphore? What is the advantage of using a counting semaphore than a binary semaphore? What is Readers-Writers problem? How it can be solved using semaphore? Explain with algorithm. 2+2+2+2+1+6

11. Write short notes on any *three* of the following: 3×5
(a) Multilevel feedback queue scheduling
(b) Real-time systems
(c) Indexed allocation method of disk space
(d) Multithreading models
(e) Hierarchical page table.

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