



WEST BENGAL UNIVERSITY OF TECHNOLOGY

CS-603

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.

GROUP A

(Multiple Choice Type Questions)

1. Answer *all* questions.

10×1 = 10

(i) A thread is a

(A) task

(B) program

(C) process

(D) lightweight process

(ii) Banker's algorithm for resource allocation is used for

(A) deadlock avoidance

(B) deadlock prevention

(C) deadlock recovery

(D) mutual exclusion

(iii) The time spent by a process in ready queue is called

(A) waiting time

(B) turnaround time

(C) response time

(D) none of these

(iv) The shell is

(A) a hardware component

(B) a command interpreter

(C) a part in compiler

(D) a tool in CPU scheduling

(v) Variable partition memory allocation can lead to

(A) external fragmentation

(B) internal fragmentation

(C) both (A) and (B)

(D) none of these

- (vi) SPOOLING stands for
- (A) Spontaneous Peripheral Operation Online
 - (B) Small Peripheral Operation Online
 - (C) Simultaneous Peripheral Operation Online
 - (D) None of these
- (vii) Page fault occurs when
- (A) the page is corrupted by application software
 - (B) the page is not in main memory
 - (C) the page is in main memory
 - (D) one tries to divide a number by 0
- (viii) Scheduling a process from Ready Queue to CPU is done by
- (A) Short Term Scheduler
 - (B) Middle Term Scheduler
 - (C) Long Term Scheduler
 - (D) Dispatcher
- (ix) Which page replacement algorithm suffers from Belady's anomaly?
- (A) LRU
 - (B) FIFO
 - (C) Optimal page replacement
 - (D) None of these
- (x) The default remedy of starvation is
- (A) ageing
 - (B) critical section
 - (C) mutual exclusion
 - (D) all of these

GROUP B
(Short Answer Type Questions)

Answer any *three* questions.

3×5 = 15

2. (a) What is "Turn Around Time"? 1+2+2
- (b) With the help of a state transition diagram, explain various states of a process.
- (c) If time quantum is very less for Round Robin Algorithm, then what will be the problems?
3. Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current head position of the disk is at 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, 170. Calculate the average cylinder movements for Shortest-Seek Time First (SSTF) algorithm. Mention the disadvantages of SSTF. 4+1

4. Describe the two basic operations on semaphore. Explain whether any integer variable with the similar operation can act as semaphore or not. 4+1
5. 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? 5
6. What is deadlock? Describe the necessary and sufficient conditions for the occurrence of deadlock. 1+4

GROUP C
(Long Answer Type Questions)

Answer any *three* questions.

3×15 = 45

7. (a) Consider the following snapshot of a system where r_i ($i = 1, 2, \dots, 4$) denote resource types and P_i ($i = 1, 2, \dots, 5$) denote processes. The vector 'Available' has usual meaning. Available Matrix ($r_1 = 2, r_2 = 1, r_3 = 0, r_4 = 0$). 4+3

Process	Current Allocation:				Maximum demand:			
	r_1	r_2	r_3	r_4	r_1	r_2	r_3	r_4
P_1	0	0	1	2	0	0	1	2
P_2	2	0	0	0	2	7	5	0
P_3	0	0	3	4	6	6	5	6
P_4	2	3	5	4	4	3	5	6
P_5	0	3	3	2	0	6	5	2

- (i) Is this system currently in a safe state? Justify your answer.
- (ii) If a request from P_3 arrives for (0, 1, 0, 0), can that request be safely granted immediately?
- (b) Consider the following set of process. CPU burst times of them are given in milliseconds. 4+4

Process	CPU Burst Time (ms)
P_1	15
P_2	5
P_3	7
P_4	10

Draw the Gantt chart for Round Robin scheduling where time quantum $q=4$ milliseconds. Calculate the average waiting time and average turn-around time. Mention the advantages and disadvantages of Round Robin scheduling.

8. (a) Consider a system with a 32-bit logical address space, a two-level paging scheme, 4 byte page table entries, 1kB pages and a 4 entry TLB. The page-table base register access time is 0 ns, TLB access time is 10 ns and memory access time is 100 ns. (2+3)+
(2×4+2)
- (i) How many address bits are needed for the page offset?
- (ii) How much memory in bytes is required to store the outer page table entry in main memory?
- (b) (i) Given references to the following pages by a program.
0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7.
How many page faults will occur if the program has three(3) page frames available to it and uses both FIFO replacement strategy and LRU replacement strategy.
- (ii) Which replacement strategy in the above performs better and why?
9. (a) What is DMA? Describe the different type of DMA Controllers. 6+3+2+2+2
- (b) What are the two major differences between segmentation and paging?
- (c) What is thrashing? How can one detect the thrashing?
- (d) What is internal fragmentation?
- 10.(a) What is context switching? Why is it considered to be an overhead? 2+2
- (b) What are the differences between process and thread? 3
- (c) What are the problems of busy-wait implementation of semaphore? Explain, how it is solved. 3+2
- (d) Mention the contents of PCB. 3
11. Write short notes on any *three* of the following: 3×5
- (a) Kernel level thread & User level thread
- (b) Dining – Philosopher Problem
- (c) Spooling
- (d) Belady's anomaly
- (e) Shortest Remaining Time First CPU scheduling.