Total No. of printed pages = 9

END SEMESTER EXAMINATION – 2021

Semester : 5th

Subject Code : Co-504

OPERATING SYSTEM

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART – A are compulsory.
2. Answer any *five* questions from PART – B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) The _____ scheduler controls the degree of multi-programming.

   (b) Deadlocks can be described more precisely in terms of a directed graph called _____.

[Turn over

(c) An address generated by the CPU is commonly referred to as a _____ address.

(d) A _____ is a collection of electronics that can operate a port, a bus or a device.

(e) Multi-processor systems (tightly coupled system) have two or more _____ in close communication sharing computer bus, memory and peripheral devices.

(f) Memory protection in a paged environment is accomplished by _____ bits associated with each frame.

(g) With demand-paged virtual memory, _____ are only loaded when they are demanded during program execution.

(h) A _____ is a named collection of related information that is recorded on secondary storage.

(i) Frequently, the free-space list is implemented as a _____.

(j) The _____ time is the time for the disk arm to move the heads to the cylinder containing the desired sector.

2. Write true or false : 1×5=5

(a) If there is no cycle in the Resource Allocation Graphs, it indicates that no deadlock exists.

(b) Each process is represented in the operating system by a State Control Block.

(c) Inter process communication using shared memory requires communicating processes to establish a region of shared memory.

(d) Waiting time is the sum of the periods spent waiting in the ready queue.

(e) A binary semaphore is semaphore with an integer value that can range only between 0 and 1.

3. Choose the appropriate alternative : 1×10=10

(a) Time quantum is defined in

(i) shortest job scheduling algorithm

(ii) round robin scheduling algorithm

(iii) priority scheduling algorithm

(iv) multi-level queue scheduling algorithm

(b) A system is in a safe state only if there exists a

(i) safe allocation

(ii) safe resource

(iii) safe sequence

(iv) safe memory

(c) Which algorithm of disk scheduling selects the request with the least seek time from the current head positions ?

(i) SSTF scheduling

(ii) FCFS scheduling

(iii) SCAN scheduling

(iv) LOOK scheduling

(d) If one or more devices use a common set of wires to communicate with the computer system, the connection is called

(i) CPU (ii) Monitor

(iii) wire full (iv) bus

(e) A character stream device transfers

(i) bytes one by one

(ii) block of bytes as a unit

(iii) with unpredictable response times

(iv) more than 2 bytes at a time

(f) Physical memory is broken into fixed-sized blocks called _____.

(i) frames (ii) pages

(iii) backing store (iv) segment

(g) In paging the user provides only one address, which is partitioned by the hardware into page number and

(i) preset (ii) onset

(iii) offset (iv) outset

(h) The CPU hardware has a wire called _____ that the CPU senses after executing every instruction.

(i) interrupt sense line

(ii) interrupt bus

(iii) interrupt receive line

(iv) interrupt request line

(i) For large data transfers, _____ is used.

(i) DMA

(ii) programmed I/O

(iii) controller register

(iv) None of the above

(j) A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called

(i) data consistency (ii) race condition

(iii) aging (iv) starvation.

PART – B

Marks – 45

4. (a) Differentiate between preemptive and non-preemptive scheduling. 2

(b) Explain the concept of multi-tasking, multi-programming, and multi-threading. 3

(c) What are the performance criteria for CPU scheduling algorithms ? 4

5. (a) Why paging is used ? 2

(b) What is the cause of thrashing ? How does the system detect thrashing ? Once it detects thrashing, what can the system do to eliminate this problem ? 3

(c) Explain the basic interrupt mechanism. 4

6. (a) What is virtual memory ? 2

(b) What is fragmentation ? Differentiate between internal fragmentation and external fragmentation. 3

(c) Consider the following page reference string : 1, 2, 3, 4, 1, 2, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults will occur for the following page replacement algorithms ? 4

(i) FIFO (ii) Optimal

Assume a set of three page-frames (initially all empty.)

7. (a) Differentiate between monolithic kernel and micro kernel. 3

(b) Discuss the concept of SCAN scheduling. 3

(c) Write a short note on Semaphore. 3

8. (a) Give the main features of the following types of OS, outlining their limitations and strengths : 5

(i) Batch OS

(ii) Real-time OS.

(b) A 16 bit computer has a page size of 4096 bytes. The page table of a process A is :

Page Number	Frame Number
00	07
01	02
02	05
03	01
04	12
05	06
06	00

For the following logical addresses, determine the corresponding physical addresses : 4

(i) 3720 (ii) 7512

(iii) 22340 (iv)17510

9. (a) Explain the following terms : 1×5=5

(i) Critical Section

(ii) Context Switching

(iii) Spooling

(iv) Monitor

(v) System call.

(b) Write the four necessary conditions that cause deadlock in a system. 4

10. Under what circumstances do page faults occur ? Describe with the help of diagram the actions taken by the operating system when a page fault occurs. 9