Ref. No.: **Ex/ET/PC/H/T/324/2024**

B.ETCE 3rd YEAR 2nd SEMESTER EXAMINATION

OPERATING SYSTEMS

Session 2023-24

Part A: Answer any 10 questions. All questions carry equal marks (CO1)Marks 10x2=20

1. Occurrence of an event is signaled by an _____ from either the hardware or the software.
2. Remote Procedure Call- Why is it so called?
3. The role of the _____ _____ is to understand the device controller and provide the rest of the OS with a uniform interface to the device.
4. Name the types of user interfaces used by operating systems.
5. What is the name given to the systems when they suffer a failure of any single component and still continue operation?
6. Show the diagrammatic representation of process in memory.
7. State the basic difference between an asymmetric multiprocessing and a symmetric multiprocessing system.
8. What is a Blade Server?
9. Draw a diagram to show transition from user to kernel mode.
10. Give the full form of VMM.
11. Show the difference between a single-threaded and a multithreaded process by a diagram.
12. Specify WORM and RW formats for a tertiary storage device.
13. What are the main components of an I/O subsystem?
14. How many page sizes does ARM architecture support?
15. What is the constant angular velocity of a magnetic disk?

Part B: Answer any 3 questions. (CO2)Marks 10x3=30

1. State the pros and cons of each of the following at both the system level and programmer level:
   a) Synchronous and asynchronous communication
   b) Automatic and explicit buffering
   c) Send by copy and send by reference
   d) Fixed-size and variable-sized messages 2.5x4

2. a) Explain with an example if it is possible to have concurrency but not parallelism.
   b) Calculate the speedup gain of an application that has a 60% parallel component for i) 2 processing cores, ii) 4 processing cores. Use Amdahl's law. 5+5

3. A system with multiple processing cores uses a spinlock or a mutex lock locking mechanisms and has waiting processes sleep while waiting for the lock to be available.Explain which locking mechanism will be used in each of the following cases:
   a. The lock is to be held for a short duration.
   b. The lock is to be held for a long duration.
   c. A thread may be put to sleep while holding the lock. 3+3+4

4. Consider the following set of processes, with the length of the CPU burst given in ms:

	Process	Burst Time	Priority
i.	P_1	2	2
ii.	P_2	1	1
iii.	P_3	8	4
iv.	P_4	4	2
v.	P_5	5	3

   The processes are assumed to have arrived in the order shown all at time 0.
   a. Draw the Gantt charts showing the execution of these processes using the following scheduling algorithms: FCFS, SJF, RR with quantum 2.
   b. What is the turnaround time of each process for FCFS?
   c. What is the waiting time of the processes for SJF? 4+3+3

5. Illustrate the strategy that a computer user can employ to maximize the amount of CPU time allocated to the user's process, for a system implementing multilevel queue scheduling. 10

6. Consider a system consisting of m resources of the same type being shared by n processes. A process can request or release only one resource at a time. Show that the system is deadlock free if the following two conditions hold:
   a. The maximum need of each process is between one resource and m resources.
   b. The sum of all maximum needs is less than m+n. 5+5

Part C: Answer any 3 questions. (CO3)Marks 10x3=30

7. Relate the memory organization schemes of contiguous memory allocation, pure segmentation, and pure paging with respect to the following:
   a. Contiguous memory allocation
   b. Pure segmentation
   c. Pure paging 4+3+3

8. Given six memory partitions of 300KB, 600 KB, 350 KB, 200 KB, 750 KB and 125 KB (in order), show how the first-fit, best-fit and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory. 8+2

9. a) Show the role of segmentation in memory management.

b) Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

Compute the physical addresses for the following logical addresses?

a. 0,430
b. 1,10
c. 2,500
d. 3,400
e. 4,112 2.5+1.5x5

10. Find the difference between the hardware and software operations and illustrate how the system establishes the corresponding physical location for the following case:
A computer provides its user with a virtual memory space of 2^{32} bytes. The computer has 2^{22} bytes of physical memory. The virtual memory is implemented by paging, and the page size is 4096 bytes. A user process generates the virtual address 11123456. 5+5

Part D: Answer any 2questions. (CO4)Marks 10x2=20

11. A disk drive has 5000 cylinders numbered 0 to 4999. The drive at present is serving a request at cylinder 2150 while the previous request was at 1805. The queue of pending requests in FIFO order is 2069, 1212, 2296, 2800, 544, 1618, 356, 1523, 4956, 3681. Starting from the current head position, calculate the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for FCFS scheduling algorithm? 10

12. Consider a file system in which a file can be deleted and its disk space reclaimed while links to that file still exist. State problems that may occur if a new file is created in the same storage area or with the same absolute path name. Show how these problems are avoided? 5+5

13. a) If an operating system has the information that a particular application will access data files in sequential manner, show how this prior information will result in improved performance?
b) Identify an application that could benefit from operating system support for random access to indexed files and illustrate. 6+4

14. a) Explain why SSDs often use a FCFS disk-scheduling algorithm
b) Illustrate why FCFS is the most fair of the scheduling algorithms and hence show that fairness is an important goal in a time-sharing system. 5+5