Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

CB3CO06 Operating System

Programme: B.Tech. Branch/Specialisation: CSBS

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. What is an operating system? **1**

(a) Interface between the hardware and application programs
(b) Collection of programs that manages hardware resources
(c) System service provider to the application programs
(d) All of these

ii. What is the main function of the command interpreter? **1**

(a) To provide the interface between the API and application program
(b) To handle the files in the operating system
(c) To get and execute the next user-specified command
(d) None of these

iii. In a multi-threaded environment _____. **1**

(a) Each thread is allocated with new memory from main memory
(b) Main thread terminates after the termination of child threads
(c) Every process can have only one thread
(d) None of these

iv. A thread **1**

(a) Is a lightweight process where the context switching is low
(b) Is a lightweight process where the context switching is high
(c) Is used to speed up paging
(d) None of these

v. Which of the following condition is required for a deadlock to be possible? **1**

(a) Mutual exclusion
(b) A process may hold allocated resources while awaiting assignment of other resources
(c) No resource can be forcibly removed from a process holding it
(d) All of these

vi. The circular wait condition can be prevented by _____ **1**
(a) Defining a linear ordering of resource types
(b) Using thread
(c) Using pipes
(d) All of these

vii. Physical memory is broken into fixed-sized blocks called _____ **1**
(a) Frames (b) Pages
(c) Backing store (d) None of these

viii. Logical memory is broken into blocks of the same size called ___ **1**
(a) Frames (b) Pages
(c) Backing store (d) None of these

ix. Files that maintain the hierarchical structure of the file system. **1**
(a) Descriptors (b) Directories
(c) Modifiers (d) Relative files

x. A filename without path information. **1**
(a) File name (b) Complete filename
(c) Directory name (d) Relative filename

Q.2 i. What are the three main purposes of an operating system? **2**

ii. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment? **3**

iii. Some CPUs provide for more than two modes of operation. What are two possible uses of these multiple modes? **5**

OR iv. What is the purpose of interrupts? How does an interrupt differ from a trap? Can traps be generated intentionally by a user program? If so, for what purpose? **5**

Q.3 i. A CPU-scheduling algorithm determines an order for the execution of its scheduled processes. Given n processes to be scheduled on one processor, how many different scheduling techniques are possible? **2**

ii. Discuss how the following pairs of scheduling criteria conflict in certain settings. **8**
(a) CPU utilization and response time
(b) Average turnaround time and maximum waiting time
(c) I/O device utilization and CPU utilization

OR iii. Consider a system implementing multilevel queue scheduling. What strategy can a computer user employ to maximize the amount of CPU time allocated to the user's process? **8**

Q.4 i. Illustrate how a binary semaphore can be used to implement mutual exclusion among 'n' processes? **3**

ii. Describe how deadlock is possible with the dining-philosophers problem. **7**

OR iii. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock free. **7**

Q.5 i. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs. **4**

ii. Discuss the hardware functions required to support demand paging. **6**

OR iii. Consider the virtual page reference string 1, 2, 3, 2, 4, 1, 3, 2, 4, 1 on a demand paging virtual memory system running on a computer system that main memory size of 3 page frames which are initially empty. Then find the number of page fault by LRU, FIFO, and optimal page replacement algorithm. **6**

Q.6 Attempt any two:

i. Describe the working of disk scheduling algorithms such as FCFS and SCAN. **5**

ii. Describe the working of Unix file system. **5**

iii. Describe how directories can be implemented efficiently. **5**

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Marking Scheme
CB3CO06 Operating System

Q.1	i.	What is an operating system? (d) All of these			**1**
	ii.	What is the main function of the command interpreter? (c) To get and execute the next user-specified command			**1**
	iii.	In a multi-threaded environment _____. (b) Main thread terminates after the termination of child threads			**1**
	iv.	A thread (a) Is a lightweight process where the context switching is low			**1**
	v.	Which of the following condition is required for a deadlock to be possible? (d) All of these			**1**
	vi.	The circular wait condition can be prevented by _____ (a) Defining a linear ordering of resource types			**1**
	vii.	Physical memory is broken into fixed-sized blocks called _____ (a) Frames			**1**
	viii.	Logical memory is broken into blocks of the same size called ___ (b) Pages			**1**
	ix.	Files that maintain the hierarchical structure of the file system. (b) Directories			**1**
	x.	A filename without path information. (d) Relative filename			**1**
Q.2	i.	Any three main purposes of an operating system			**2**
	ii.	As per explanation		3 marks	**3**
	iii.	Two modes of operation	(2.5 marks * 2)	5 marks	**5**
OR	iv.	Purpose of interrupts		1 mark	**5**
		Difference		2 marks	
		Traps be generated intentionally by a user program		1 mark	
		Reason		1 mark	
Q.3	i.	Different scheduling techniques	(0.5 marks * 4)	2 marks	**2**
	ii.	(a) CPU utilization and response time		2 marks	**8**
		(b) Average turnaround time and maximum waiting time		3 marks	
		(c) I/O device utilization and CPU utilization		3 marks	
OR	iii.	Definition		3 marks	**8**
		Strategies		5 marks	
Q.4	i.	Code		3 marks	**3**
	ii.	Diagram		1 mark	**7**
		Theory		2 marks	
		Code		4 marks	
OR	iii.	RAG diagram		5 marks	**7**
		Safe State		2 marks	
Q.5	i.	Circumstances		2 marks	**4**
		Actions		2 marks	
	ii.	Diagram		4 marks	**6**
		Theory		2 marks	
OR	iii.	Page fault algorithms	(2 marks * 3)	6 marks	**6**
Q.6		Attempt any two:			
	i.	FCFS		2.5 marks	**5**
		SCAN		2.5 marks	
	ii.	Diagram		2 marks	**5**
		Description		3 marks	
	iii.	Link Lists		2.5 marks	**5**
		Hash Table		2.5 marks	

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