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Bharati Vidyapeeth's

Institute of Computer Applications and Management (BVICAM),

A-4, Paschim Vihar, New Delhi-63

FIRST SEMESTER [MCA] Supplementary Internal Examination, January 2023

Paper Code: MCA–105	**Subject: Operating Systems with Linux**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt FIVE questions in all. Question No. 1 is compulsory, and attempt one question from each unit.

1. Answer all the following questions briefly: - 1.5 × 10 = 15

   (a) Demonstrate the bootstrap process with a suitable diagram. CO1

   (b) Differentiate between internal command and external command in Linux. Give 2 - 2 examples of each. CO1

   (c) Describe the major design goals of the operating system. CO1

   (d) Identify the responsibilities of the kernel in an operating system. CO1

   (e) Differentiate between asymmetric multiprocessing and symmetric multiprocessing. CO1

   (f) List the circumstances for CPU-scheduling decisions. CO2

   (g) Identify the limitations of multilevel queue scheduling. How these limitations are addressed by multilevel feedback queue scheduling? CO2

   (h) Explain busy waiting and sleep waiting approaches in operating system. CO2

   (i) Describe the algorithmic structure of process Pi and Pj in Peterson's algorithm. CO2

   (j) What is readers–writers problem? Which approach is appropriate to solve the readers–writers problem? CO2

UNIT - I

2. (a) Describe different types of kernels with their advantage and disadvantages. 5 CO1

   (b) What is distributed operating system? Compare client–server computing and peer–to–peer computing. 5 CO1

   (c) Identify the need of direct memory access (DMA). Describe the working of DMA. 5 CO1

3. (a) Explain the working of dual-mode operation (with a neat diagram) in operating system. 5 CO2

   (b) Differentiate between long-term scheduler and short-term scheduler. Identify the need of medium-term scheduler. 5 CO2

   (c) What is system call? Describe the use of following systems calls of Linux (with syntax in 'C' programming: (a) access, (b) creat, (c) brk, and (d) chmod. 5 CO2

UNIT - II

4. (a) Three processes P1, P2 and P3 arrive at time zero. Their total execution time is 20ms, 30ms, and 40ms respectively. They spent first 10% of their execution time in doing I/O, next 70% in CPU processing and the last 20% again doing 5 CO2

I/O. For what percentage of time was the CPU free? Use Round robin algorithm with time quantum 10ms.

(b) What is Semaphore? Describe different types of Semaphores. How counting Semaphore is used for process synchronization? 5 CO2

(c) Explain the critical-section problem. Identify the requirements that should be satisfied by a critical-section. 5 CO2

5. (a) Consider the following set of processes with the length of the CPU burst given in milliseconds: 5 CO2

Process:	P1	P2	P3	P4
Arrival Time:	0	0	0	10
Burst Time:	4	3	8	5
Queue No.:	1	1	2	1

Priority of Queue 1 is greater than Queue 2. Queue 1 uses Round Robin (Time Quantum = 2) and Queue 2 uses First-Come, First-Served. Determine the average waiting time of each process.

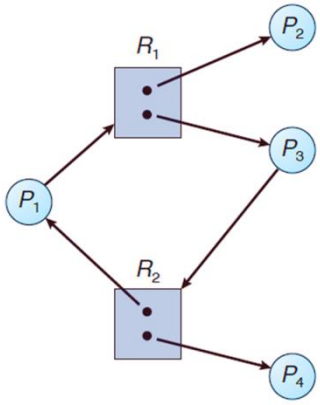
(b) Explain the Bakery algorithm for process synchronization. List the limitations of the Bakery algorithm. 5 CO2

(c) Compare the preemptive and non-preemptive scheduling. Explain various CPU-scheduling criteria. 5 CO2

UNIT - III

6 (a) What is deadlock? How it is different from starvation? Describe the characteristics of deadlock. 5 CO3

(b) Explain the Banker's algorithm for resource allocation denial to avoid deadlock in the system. Detect the deadlock in the following graph. 5 CO3



(c) Compare intrernal and external fragmentation. Discuss various memory allocation policieis. 5 CO3

7 (a) What is resource allocation graph? How it is used to detect the deadlock in the system? 5 CO3

(b) Describe different types of addressing binding approaches. With suitable example, explain the dynamic linking process. 5 CO3

(c) What is demand paging? Consider a system supporting, LA = 32 Bits, PA = 27 Bits, PS = 4KB, Page Table Entry Size (e) = 3 Byte. What is Page Table Size? 5 CO3

UNIT - IV

8	(a)	Differentiate between sequential file and indexed file. Identify the need of inverted file.	5	CO4
	(b)	A disk queue requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. Determine the total head movement (in cylinders) if the disk head is initially at cylinder 53 and the disk arm is moving toward 0.	5	CO4
	(c)	What is directory structure? Describe the following schemes of defining the logical structure of directory: (i) Single-Level Directory, (ii) Two-Level Directory, (iii) Tree-Structured Directories.	5	CO4
9	(a)	What is the difference between text file and binary file? Explain various operations performed on a file.	5	CO4
	(b)	What is positioning time and rotational latency? Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 with 4 page frames. Find number of page faults using least-recently-used algorithm.	5	CO4
	(c)	Explain the linked allocation approach (with a suitable diagram) of allocating disk space. What are the advantages and limitations of linked allocation approach?	5	CO4