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THIRD SEMESTER [MCA] Internal Examination, November 2023

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

Time: 2 Hours	Maximum Marks: 45

Note: Attempt THREE 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) Discuss the design goals of an operating system when the user sits in front of a PC, CO1 consisting of a monitor, keyboard, mouse, and system unit.

   (b) Explain the bootstrap process of operating system. CO1

   (c) List the responsibilities of kernel in an operating system. Which type of kernel is used CO1 in Linux system?

   (d) Differentiate between monoprogramming and multiprogramming. CO1

   (e) Draw the state transition diagram of a process. CO1

   (f) Discuss the need of multilevel feedback queue scheduling by considering an CO1 appropriate example.

   (g) Explain the functions of a dispatcher in operating system. CO3

   (h) Discuss the Semaphore mechanism to solve the critical-section problem. Identify the CO3 situation when the value of semaphore becomes negative.

   (i) Identify the conditions to be fulfilled for the solution of a critical-section problem. CO3

   (j) Write code snippet of TestAndSet() and its implementation code to solve the critical- CO3 section problem.

UNIT - I

2. (a) Discuss the various components of an operating system. Identify the need of 7.5 CO1 dual mode operation in operating system.

   (b) Explain inter-process communication with its models. 7.5 CO1

3. (a) Explain the process control block (PCB). Discuss the PCB implementation 7.5 CO1 approach in Linux.

   (c) Describe the following terms: (a) asymmetric multiprocessing, (b) interrupt, (c) 7.5 CO1 system call, (d) multithreading, and (e) medium-term scheduler.

UNIT - II

4. (a) Discuss the various scheduling criteria for CPU scheduling. Consider a system 7.5 CO3 follows multilevel queue scheduling with following four processes:

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 scheduling algorithms. Draw the Gantt chart and determine the average waiting time of each process.

(b) Explain the readers–writers problem. Write algorithm (code snippet) to solve the readers–writers problem using Semaphore.   7.5   CO3

5. (a) Compare preemptive scheduling and non-preemptive scheduling. Consider the following set of processes with the length of the CPU burst given in milliseconds: 7.5   CO3

Process	P1	P2	P3	P4	P5
Arrival Time	3	6	4	5	2
Burst Time	0	2	4	6	8

Determine the average waiting time, average turnaround time and throughput using shortest remaining time first and round-robin (quantum = 2 ms) scheduling algorithm.

(b) Explain the Bakery algorithm (with code snippet) for critical-section problem. Discuss that the Bakery algorithm satisfies the three requirements of solution of critical-section problem?   7.5   CO3