**TRIBHUVAN UNIVERSITY**

**BUTWAL MULTIPLE CAMPUS**

**INTERNAL EXAM (2076)**

**Institute of Science and Technology**

Bachelor Level/ Second Year/ Fourth Semester/ Science Full Marks: 60  
**Computer Science and Information Technology (CSC. 259)** Pass Marks: 24  
(Operating Systems) **Set-A** Time: 3 hours.

**Group A**

**Attempt any two questions (2X10=20):**

1. Given references to the following pages by a program,  
   0,9,0,1,8,1,8,7,8,7,1,2,8,2,7,8,2,3,8,3  
   How many page faults will occur if the program has three page frames for each of the following algorithms?  
   a.) FIFO  
   b.) Optimal  
   c.) Second chance  
   d.) LRU
2. What is deadlock? Discuss the Bankers algorithm of multiple resources for avoidance of deadlock with suitable example.
3. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds

Process Burst Time Priority

P1 10 3  
P2 1 1  
P3 2 3  
P4 1 4  
P5 5 2  
The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a  
non-preemptive priority (a smaller priority number implies a higher priority), and RR  
(quantum = 1) scheduling.  
b. What is the turnaround time of each process for each of the scheduling algorithms in  
part a?

c. What is the waiting time of each process for each of the scheduling algorithms in part  
a?  
d. Which of the schedules in part a results in the minimal average waiting time (over all  
processes)?

**Group B**

**Attempt any eight questions (8X5=40):**

1. List four necessary conditions for deadlock. Explain each of them briefly what would be necessary (in the operating system) to prevent the deadlock.
2. Provide two programming examples of multithreading giving improved performance over a single-threaded solution.
3. What is the meaning of busy waiting? What others kinds of waiting are in OS? Compare each type on their applicability and relative merits.
4. Distinguish Indefinite postponement and Deadlock.
5. What is the difference between a physical address and a virtual address?
6. Draw & describe the 5-state process model.
7. Why are page sizes always a power of 2?
8. Distinguish the paging and segmentation.
9. What do you mean by memory fragmentation? Distinguish between the internal and external fragmentation.

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(Operating Systems) **Set-B** Time: 3 hours.

**Group A**

**Attempt any two questions (2X10=20):**

1. Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. In answering the questions, use non preemptive scheduling and base all decisions on the information you have at the time the decision must be made.

Process Arrival Time Burst Time

P1 0.0 8  
P2 0.4 4  
P3 1.0 1

1. What is the average turnaround time for these processes with the FCFS scheduling  
   algorithm?
2. What is the average turnaround time for these processes with the SJF scheduling algorithm?
3. The SJF algorithm is supposed to improve performance, but notice that we chose to  
   run process P1 at time 0 because we did not know that two shorter processes would  
   arrive soon. Compute what the average turnaround time will be if the CPU is left  
   idle for the first 1 unit and then SJF scheduling is used. Remember that processes P1  
   and P2 are waiting during this idle time, so their waiting time may increase.
4. Consider the following page reference string ; 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults would occur for the LRU replacement, FIFO replacement, & optimal replacement algorithms? Assuming three frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.
5. Why some process requires high priority? What would happen if all processes have the same priority? Mention merits and demerits of assigning priority on process.

**Group B**

**Attempt any eight questions (8X5=40):**

1. How does process differ from program? Explain process state with the help of block diagram.
2. Provide two programming examples of multithreading that would not improve performance over a single-threaded solution.
3. What is critical section problem? Why executing critical section must be mutual exclusive? Explain.
4. What do you mean by deadlock prevention? Mention the mechanism for deadlock prevention.
5. How fragmentations occur? Discuss the techniques that manage the fragmentation.
6. A machine has 48-bit virtual addresses and 32-bit physical addresses. Pages are 8 KB.  
   How many entries are needed for the page table?
7. Describe how TLB increase performance in paging
8. Explain the mapping of virtual address to real address under segmentation.
9. Show how sleep and wake up solution is better than busy waiting solution for the critical section problem.