University of Sargodha

M.Sc. 2nd Term Examination 2019

Subject: Information Technology **Paper: Operating System (CMP-3611)**

Maximum Marks: 80

Time Allowed: 2:30 Hours

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part (Compulsory) (16*2)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet.

i. Suppose there is an organization which hired a person for dividing tasks among other persons. Which multiprocessing environment does this organization depict?
ii. Draw *Interrupt Timeline* clearly mentioning interrupt occurred by a process.
iii. What exactly do you mean by CONTEXT in context switching?
iv. Differentiate between preemptive and non-preemptive scheduling
v. Which one of the following scheduling algorithm(s) could result in starvation? FCFS, SJF, Round Robin.
vi. What is the difference between deadlock avoidance, prevention and detection?
vii. What does it mean to Preempt a process?
viii. FIFO and LRU both use previous information in page replacement policy. How is one different from another then?
ix. Differentiate between *Concurrency* and *Parallelism* with example.
x. Mention at least 4 *System Calls* when you enter a command that copies a file from one path to another.
i. Why *Peterson* solution is not violating Bounded-wait?
ii. Why do we call a program passive entity and a process active entity?
iii. Differentiate between progress and bounded-waiting with example.
iv. Why SJF can't be used in real-time environment when you don't have execution history of the programs?
v. Write names of all preemptive and non-preemptive scheduling policies.
vi. Suppose that we have free segments with sizes: 6, 17, 25, 14, and 19. Place a program with size 13kB in the free segment using first-fit, best-fit and worst fit?

Subjective Part (3*16)

Q.2. Discuss the advantages and disadvantages of guaranteeing reliable transfer of data between modules in the STREAMS abstraction.

Q.3. a) Explain when a *Deadlock* can and when it cannot occur in the below scenario when two processes (P0, P1) are competing for semaphore S=1 and Q=1. (8)

```
        P0                  P1
wait(S);            wait(Q);
wait(Q);            wait(S);
  .                   .
  .                   .
  .                   .
signal(S);          signal(Q);
signal(Q);          signal(S);
```

b. How Peterson's solution preserves 3 properties for critical section problem i.e. *Mutual exclusion, Progress* and *Bounded-Waiting?* (8)

Q.4. a) For the data given below:

	Allocation	*Need*	*Available*
	A B C	*A B C*	*A B C*
P_0	0 1 0	7 4 3	2 3 0
P_1	3 0 2	0 2 0	
P_2	3 0 2	6 0 0	
P_3	2 1 1	0 1 1	
P_4	0 0 2	4 3 1	

Apply Banker's algorithm and argue with reasoning whether requests should be granted or not.

i. *Can request for (3,3,0) by P_4 be granted?* (4)
ii. *Can request for (0,2,0) by P_0 be granted?* (6)

b) *Compare the memory organization schemes of Contiguous Memory Allocation, Segmentation, and Paging with respect to the following issues:* (6)

i. External fragmentation ii. Internal fragmentation

Suppose m=5 (2^5 bytes), n=1, Physical Address Space = 144 bits.

i. What is Logical Address Space? (2)
ii. What is Page Size? (2)
iii. What is size of Page Number? (3)
iv. What are total number of pages in Main Memory? (3)
v. How many pages required to load this process in Main Memory? (3)
vi. How many total Pages in Main Memory? (3)
vii. If OS takes 5 pages, how many others pages left for user processes? (2)

a) Consider the following page reference using three frames that are initially empty. Find the page faults using Optimal algorithm, where the page reference sequence: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1? (6)

b) Apply LRU on dataset provided in Question 6 part a, and compare the results. (10)