

Final Assessment Test (FAT) - May 2024

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| Programme | M.Tech. (Integrated) | Semester | WINTER SEMESTER 2023 - 24 |
| Course Title | OPERATING SYSTEMS | Course Code | SWE3001 |
| Faculty Name | Prof. SANGEETHA N | Slot | E1+TE1 |
| | | Class Nbr | CH2023240502860 |
| Time | 3 Hours | Max. Marks | 100 |

General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Section - I

Answer all questions (7 X 10 Marks = 70 Marks)

Q1. Consider a scenario of a multiuser operating system deployed on a server, where multiple users simultaneously access and interact with the system. Explain in detail how the operating system employs dual mode operation to manage user processes and system resources. In addition ensure system security and stability. [10]

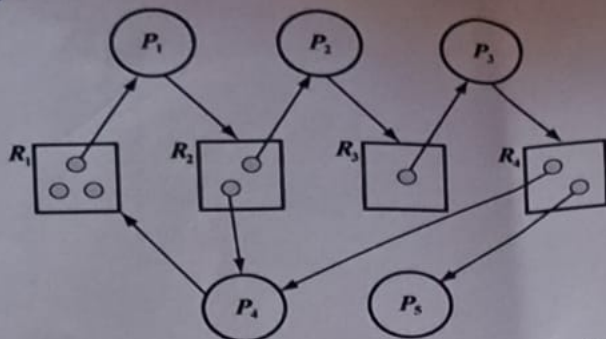
Q2. a) How many times the fork will be executed and child will be printed. Explain the child process creation. (5 marks) [10]

```
void main()
{
for(int i = 0; i < 4; i++)
{
pid_t ret=fork();
if( ret ==0)
printf("child: %d\n", i);
}
}
```

b) Explain in detail the execution of the code segment given below and the value of 'a' printed by parent and child process. (5 marks)

```
#include <stdio.h>
#include <unistd.h>
#include<sys/types.h>
int a=2;
int main()
{
pid_t ret=fork();
if(ret == 0)
{
```

Consider the following resource allocation graph.



- Convert the graph into matrix representation. i.e., Allocation, Request and Available (4 Marks)
- Is the system potentially deadlocked? If so, which process are deadlocked and suggest a suitable recovery mechanism. (6 Marks)

In a smart factory environment, imagine a computer system controlling a robotic arm equipped with a disk drive. The disk drive has 300 cylinders numbered from 0 to 299. The robotic arm must efficiently access data to complete tasks promptly for cylinder 182, 70, 143, 140, 24, 161, 220.

Given the current position of the robotic arm at cylinder 167 and the completion of the previous task at cylinder 250, Calculate the total distance (in cylinders) when the robotic arm is moved using the algorithms given below:

- SSTF (5 marks)
- C-SCAN (5 marks)

- Amazon uses a RAID level model to recover their critical data disks from failure. They maintain a parity that is spread across $N+1$ disks. Comment on the RAID Level that you suggest for the above statement. (5 marks)
- A small organization required a model to have better performance in critical applications, fault tolerant and better storage capacity utilization...Comment on the RAID Level that you suggest for the above statement. (5 marks)

Section - II

Answer all questions (2 X 15 Marks = 30 Marks)

- Consider a system in which memory consists of the following hole sizes in memory order: 10K, 4K, 20K, 18K, 7K, 9K, 12K and 15K. Which holes will be allocated for the requests made by the processes of various sizes as follows: 12K, 10K and 9K. Apply first fit and best fit allocation algorithms and identify which algorithm results in efficient allocation. Also discuss about internal and external fragmentation in allocation. (10 marks)
- Consider a process with 4 logical pages numbered 0-3. The process runs on a system with each page of size 4 bytes and a physical memory of size 32 bytes. The page table consists of the following logical page number to physical frame number: (0,4) (1,8) (2,3) (3,6). Map the given logical addresses to the corresponding physical addresses. Logical address 2 (page 0, offset 2), Logical address 5 (page 1, offset 2), Logical address 8 (page 2, offset 0), Logical address 13 (page 3, offset 1), Logical address 3 (page 0, offset 4). (5 marks).

Q9. Consider the following page reference string:

1, 2, 1, 0, 3, 0, 4, 2, 4, 7, 1, 2.

How many page faults will occur by applying FIFO and LRU page replacement algorithm with three frames first and then with four frames. Remember that all the frames are empty initially.

Discuss what happens to the page fault when different frame size are and determine whether the algorithm suffers from belady's anomaly. Justify your answer.

