ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY

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(Affiliated to VTU Belagavi, Approved by AICTE, New Delhi, Recognized by Govt. of Karnataka)

ASSIGNMENT BOOK

Branch : Artificial Intelligence & Machine learning

Assignment Number	Date of Submission	Maximum Marks 20 / Marks Obtained	Signature of the Student with Date	Signature of the Teacher with Date
1	17/8/23	20	Vishal 17/8/23	
2	1/9/23	20	1/9/23	8/9/23
3		= 20/20		
4				
5	Quiz.	19		
Total Marks				
Average Assignment Marks		39		
Marks in words :		Thirty Nine		

Name : Vishal Dsouza

USN : 4AL21A1068

Sem. & Section : 4th Sem

Subject Name / Code : Operating System / 21CS 44

Submitted to Prof. : Mr Shrikanth M G

Assignment Marks 39 / Max. Marks 40

Signature of Faculty

VISION OF THE INSTITUTE

"Transformative education by pursuing excellence in Engineering and Management through enhancing skills to meet the evolving needs of the community

MISSION OF THE INSTITUTE

- To bestow quality technical education to imbibe knowledge, creativity and ethos to students community.
- To inculcate the best engineering practices through transformative education.
- To develop a knowledgeable individual for a dynamic industrial scenario.
- To inculcate research, entrepreneurial skills and human values in order to cater the needs of the society.

VISION OF THE DEPARTMENT

Foster competent professional by installing knowledge skills in AIML relam to cater needs of industry and community

MISSION OF THE DEPARTMENT

* To strengthen the assimalation process of concept in AIML through experiential learning
* To create a better Academia - Industry liasion by means of skill enhanced training
* To develop a support for research & development
* To promote Entereprenunal culture through interaction collaborative knowledge partner

COURSE OUTCOMES

CO1	Relate the fundamentals of OS & process management concepts
CO2	Apply suitable techniques for process scheduling & synchronizatio
CO3	~~various~~ Apply various concepts of deadlock detection, prevention and memory management strategies
CO4	Illustrate the concept of virtual memory management and file systems
CO5	Extend the concepts of secondary storage structure & linux OS using case studies
CO6	

Assignment

1 The Fibonacci sequence is the series of numbers 0, 1, 2, 3, 5, 8

Formally, it can be expressed as :

fib 0 : 0

fib 1 : 1

fib i : fib(i-1) + fib(i-2)

Write a C program using the fork() system call that generates the fibbonacci sequence in the child process the number of the sequences will be provided in the command line. for example fibonacci sequence will be output by the child process because the parents & child process how their own copies of the data it will be necessary for the child process have their own copies of the data it will be necessary for the child to compile before existing the program perform necessary error checking to ensure that a non-negative number is passed on the command line the C program to find the fibonacci sequnce

→ using fork() system

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/wait.h>
int main(int argc, char *argv[])
{
// check if the user provided a non-negative number as input
if (argc != 2)
{
    printf("Usage: ./fibonacci <number>\n");
    return 1;
}
```

```
// Get the number of fibonacci number to generate
int n = atoi(argv[i]);
if (n<0) {
printf(" Please enter a non negative number \n");
return 1;
}
// create a child process
pid_t pid = fork();
if (pid==0) {
int a=0;
int b=1;
int i;
for (i=0; i<n; i++) {
int c = a+b;
printf("%d ", c);
a=b;
b=c;
}
printf("\n");
exit(0);
}
// wait for the child process to exit
int status;
wait(& status);
// Exit the parent process
return 0;
}
```

Here the program first checks if the user provided a non-negative number as input. if not if prints an error message and exits. otherwise, it gets the number of fibonacci numbers to generated and creates a child process

The child process then generates the fibonacci sequence and prints it to the console. once the child process has finished the parent process waits for it to ~~exist~~ exit, and the ~~exist~~ exits itself

3 Write a multithreated java program that outputs prime numbers. This program should work as follows. the user will run the program and will enter a number on the command line. the program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user

→ The java program for prime number will be

```
import java.util.Scanner;
public class primenumbers {
    public static void main (String[].args){
    Scanner scanner = new Scanner (System.in);
    System.out.println (" Enter a number ");
     int number = Scanner.nextInt();
     Thread thread = new Thread (new primenumber printer (number));
 // Create a thread to print a prime number
     thread.start();
// wait for the thread to finish.
  try {
     thread.join();
     } catch (Interrupted Exception e) {
         e.printStackTrace();
     }
// print a message when the thread is finished
   System.out.println (" Finished printing prime number ");
   }
  }
```

```
class primenumberprinter implements Runnable {
  private in number ;
  public printNumber Printer (int number ) {
     this number = number ;
}
@ override
public void run () {
 // print the prime numbers
 for (int i=2 ; i<= number ; i++ ) {
 boolean isprime = true ;
 for (int j=2 ; j<= math.sqrt (i) ; j++) {
 If (i % j == 0) {
 is prime = false ;
 break ;
 }
}
 if (is prime) {
  system . out . println (i) ;
}
}
}
}
```

This program first creates a scanner to read the user input Then it gets the number from the user and creates a thread to print the prime numbers. The Thread then start printing the prime numbers one by one, once the thread is finished the main thread prints a message to the console

The primenumber printer class implements the runnable interface which means that it can be used to create a thread The run() method of the primenumber printer class prints the print prime numbers

4 Explain the sleeping Barber problem in OS.

→ The sleeping barber is a classic synchronization problem in operating system. It is a hypothetical situation in which there is a barber shop with one barber and a number of chairs for waiting customers. The barber is initialy asleep in his chair when a customer arrives they wake up the barber finishes cutting a custumers hair they go back to sleep.

Here the problem is that if there are no customers waiting the barber will goto sleep and stay asleep forever, This is because the barber has no way of knowing if there are any customer waiting so they will just keep sleeping.

There are number of ways to solve the problem one solution is to use semaphones. A semaphore is a synchronization primitive that can be used to controll access to a shared resource. In this case, the shared resoures is the barber chain.

To solve the sleeping barber problem using semaphones we can use two semaphores.

* A semaphore called customers that counts the number of customers waiting in the barber shop.
* A semaphore called barber that indicates whether the barber is asleep or a wake.

When a customer arrives they will first aquire the customers semaphores. This will increment the value of the semaphores this will increment the value of the semaphore, including that there is one more cansumer waiting then they will acquire the barber is asleep. When the barber wakes up they will see that the customers semaphores is greater than zero, so

they will acquire it and start cutting the customer hair

When the barber is finished cutting the customer hair they will release the customers semaphore and the barber semaphore, this will allow the next consumer to acquire the customer semaphore and make up the barber

this solution to the sleeping barber problem ensure that the barber will never go to sleep if there are customer waiting

2, Write a program to avoid the race condition in operating system.

→ Avoiding race condition in operating system requires careful synchronization of concurrent processes or threads that access shared resources. one common approach is to use lock on the synchronization mechanism to ensure that only the one process or thread can access the shared resource at a time. A simple python program that demonstrates how to avoid a race condition using the threading module

```
import threading
counter = 0
lock = threading.lock()
# lock for synchronization
# function to increment the counter safely
def increment_counter():
    global counter
    for in range(1000000):
        with lock:
            counter += 1
```

```
# create multiple threads to increment
# the counter
num_threads = 4
threads = [ ]
for _ in range (num_threads):
        threads = threading.Thread ( target = increment_counter)
        threads.append (thread)
        thread.start()
# wait for all threads to finish.
        for thread in threads:
            thread.join()
# print the final counter value
    print ("Final counter value :", counter)
```

In this example threading.lock() , object is used to synchronize access to the 'counters' variable, The 'with lock:' statement ensure that only one thread can execute the critical section of code (incrementing the counter) at a time.

Output :

Final counter value is :- 40000

5 Consider the following set of processes with the length of the CPU burst given in milliseconds.

processes	Burst time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to ~~not~~ have arrived in the order P_1, P_2, P_3, P_4, P_5 all at time 0

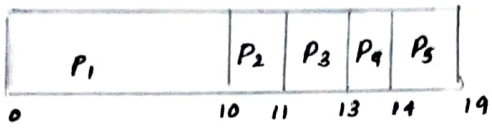
a) Draw for gnatt chart that illustrate the execution of these ~~processing~~ process using the following scheduling algorithm FCFS, SJF, non-preemptive priority (a smaller priority number implies a higher priority, and RR (Quantum = 1)

b) What is the turnaround time of each process for each of the scheduling algorithm in part a) ?

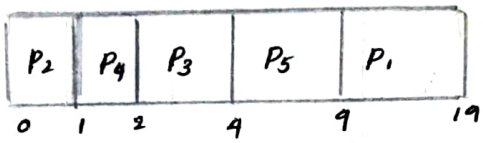
c) What is the waiting time of each process of each of the scheduling algorithm in part a).

d) Which of the algorithm in part a results in minimum average waiting time

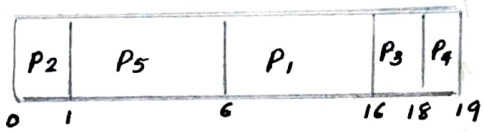
a) Gantt chart for FCFS



Gantt chart for SJF



Gantt chart for Non-preemptive priority.

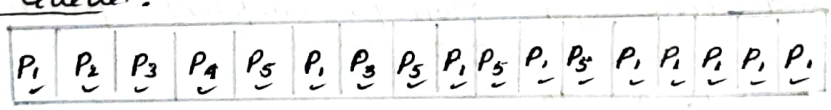


∴ lower number is higher priority

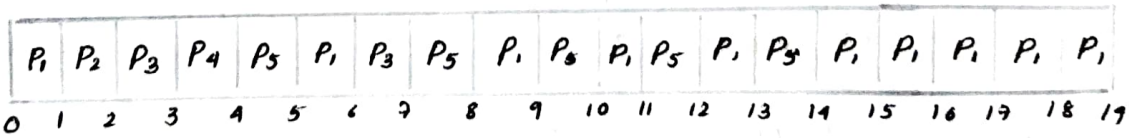
Gantt chart for Round Robin.

Ready Queue :-

Time Quantum = 1



Gantt chart



6) Turnaround time for FCFS :

Turnaround time = completion time - Arrival time

i.e.

$P_1 \rightarrow 10 - 0 = 10$

$P_2 \rightarrow 11 - 0 = 11$

$P_3 \rightarrow 13 - 0 = 13$

$P_4 \rightarrow 14 - 0 = 14$

$P_5 \rightarrow 19 - 0 = 19$

Turnaround time for SJF :

$P_1 \rightarrow 19 - 0 = 19$

$P_2 \rightarrow 1 - 0 = 1$

$P_3 \rightarrow 4 - 0 = 4$

$P_4 \rightarrow 2 - 0 = 2$

$P_5 \rightarrow 9 - 0 = 9$

Turnaround time for Non pre-emptive pnority :

$P_1 \rightarrow 16 - 0 = 16$

$P_2 \rightarrow 1 - 0 = 1$

$P_3 \rightarrow 18 - 0 = 18$

$P_4 \rightarrow 19 - 0 = 19$

$P_5 \rightarrow 6 - 0 = 6$

Turnaround time for RR :

$P_1 \rightarrow 19 - 0 = 19$

$P_2 \rightarrow 2 - 0 = 2$

$P_3 \rightarrow 7 - 0 = 7$

$P_4 \rightarrow 4 - 0 = 4$

$P_5 \rightarrow 14 - 0 = 14$

c) waiting time for FCFS

waiting time = Turnaround time - Burst time

$P_1 \rightarrow 10 - 10 = 0$

$P_2 \rightarrow 11 - 1 = 10$

$P_3 \rightarrow 13 - 2 = 11$

$P_4 \rightarrow 14 - 1 = 13$

$P_5 \rightarrow 19 - 5 = 14$

waiting time for SJF

$P_1 \rightarrow 19 - 10 = 9$

$P_2 \rightarrow 1 - 1 = 0$

$P_3 \rightarrow 4 - 2 = 2$

$P_4 \rightarrow 2 - 1 = 1$

$P_5 \rightarrow 9 - 5 = 4$

waiting time for non preemptive priority

$P_1 \rightarrow 16 - 10 = 6$

$P_2 \rightarrow 1 - 1 = 0$

$P_3 \rightarrow 18 - 2 = 16$

$P_4 \rightarrow 19 - 1 = 18$

$P_5 \rightarrow 6 - 5 = 1$

waiting time for Round Robin:

$P_1 \rightarrow 19 - 10 = 9$

$P_2 \rightarrow 2 - 1 = 1$

$P_3 \rightarrow 7 - 2 = 5$

$P_4 \rightarrow 4 - 1 = 3$

$P_5 \rightarrow 14 - 5 = 9$

d) Average waiting time for all process :

$$\text{Average waiting time} = \frac{\text{sum of waiting time of all process}}{\text{No of processess}}$$

For ~~SJF~~ FCFS :

Avg WT = 0+10+11+13+14 / 5 = 9.6 milliseconds

For SJF :

Avg WT = 9+0+2+1+4 / 5 = 3.2 milliseconds

For Non preemptive pronty :

Avg WT = 6+0+16+18+1 / 5 = 8.2 milliseconds

For R.R

Avg WT = 9+1+5+3+9 / 5 = 5.4 milliseconds

Here by using SJF (shortest Job first) Algorithm we can get minimum average waiting time.

1. Output :

```
gcc -o fibonacci fibonacci.c
./fibonacci : 5
1 1 2 3 5
```

3 Output.

```
Enter a Number 5
5
3
2
1
```

10/10 = 20/20

Sai
20/8/23.

Assignment 2.

1 A single lane bring connects the two vermont village of North Tunbridge & south Tunbridge, Farmers in the two villages use this bridge to deliver their produces to the neighbouring town. The bridge can become deadlocked if both a northbound & a southbound farmer get on the bridge at the same time (vermant farmer are stubborn and are unable to back up.) using semaphores design an algorithm that prevent deadlocks. Initially do that be concerned about starvation (the situation in northbound farmers prevent Southbound farmers form using the bridges or vice versa).

→ To prevent a deadlock on the single-lane bridge connecting North Tunbridge & south Tunbridge, we can use semaphores to control the access of farmer.nto the bridge So lets call these semaphores 'north semaphore' and south semaphore.' Here's a simple algorithm using semaphores to prevent deadlock.

```
from threading import Semaphore:
    class Bridge:
        def __init__(self):
            self.northSemaphore = Semaphore(1)
            self.southSemaphore = Semaphore(1)
            self.northWaiting = 0
            self.southWaiting = 0

        def cross_bridge(self, direction):
            if direction == "north":
                self.northWaiting += 1
                self.northSemaphore.acquire()
                self.northWaiting -= 1

            # Check if there are no southbound farmers on the
              bridge
```

```
        if self.southWaiting == 0:
            self.southWaiting += 1
            self.northSemaphore.release()

        else:
            self.southWaiting += 1
            self.southSemaphore.acquire()
            self.southWaiting -= 1

    # Check if there are no northbound farmers on the bridge
        if self.northWaiting == 0:
            self.southSemaphore.release()

    # Code to simulate crossing the bridge
        print(f"{direction.capitalize()} bound farmer is
              crossing the bridge.")
        # Simulate crossing time
        # ....
        # Release the semaphore after crossing
        if direction == "north":
            self.northSemaphore.release()
        else:
            self.southSemaphore.release()

# Example usage
def farmer_thread(direction, bridge):
    bridge.cross_bridge(direction)
bridge = Bridge()
```

```
# create and start farmer threads
northbound_thread = threading.Thread(target=farmer_thread, args=
                                     ("north", bridge))
southbound_thread = threading.Thread(target=farmer_thread,
                                     args=("south", bridge))

northbound_thread.start()
southbound_thread.start()

northbound_thread.join()
southbound_thread.join()
```

In this algorithm, farmer from both directions wait for the semaphore associated with their direction. If there are no farmers waiting from the opposite direction, the semaphore is released immediately, allowing the farmer to cross the bridge. This way, the bridge will never deadlock due to concurrent access from both directions

Remember that this algorithm doesn't consider starvation, which could lead to one direction monopolizing the bridge. If you need to address starvation, you would need to implement a more complex solution that ensure fairness in accessing the bridge for both direction.

2 Why are segmentation and paging sometimes combined into one scheme ?

Segmentation and paging are two memory management techniques used in ~~word~~ modern operating systems to manage a computer's memory ~~efficiency~~ efficiently. Each technique has its own advantages and limitations. Sometimes, these technique are combined into a single scheme to leverage the benifits to both while mitigating their individual drawbacks

Here's why segmentation and paging are sometime combined :

1) Felxible memory Management : Segmentation allows memory to be divided into logically meaningful segments, such as code, data and stock segments. This provides a clear distinction between different parts of a program. paging, on the other hand, offers a uniform and fixed-size memory block management. By combining the two, you can have the flexibility of segmentation for logical organization and paging for efficient memory allocation.

2) Protection and isolation : Segmentation provides a natural way to enforce memory protection and isolation between segments. This is particularly useful in a multi-user environment where different processos ~~are~~ or uses need to be prevented from accessing each other's memory. Paging with its fixed-size pages, provides additional protection and isolation benefits. Combining both can enhance the overall security and isolation of the system.

3) Large Address Spaces : Segmentation is helpful when dealing with dealing with large address spaces as it allows addressing of segments through a shorter logical address. However, managing large segments can lead to fragmentation. Paging helps mitigate fragmentation by breaking memory into fixed-size pages. Combing both techniques can provide a balance between large address spaces and effiuent memory utlization.

4) Mitigating Drawback : Segmentation can lead to exteinel fragmentation, where free memory blocks are scattered across memory. Paging helps alleviate this issue by using fixed p size. pages, reducing external fragmentation. Combining both can b. ~~techn~~ help manage memory more effectively by overcoming the drawbacks of each techniques

5) Hybrid Memory Models: Some systems use a hybrid memory model that combines both segmentation and paging for specialized purposes For example, on operating system might use segmentation for managing different processes code, data and stack segments and then use paging within those segments to efficiently manage memory allocation.

However, its important to note that combinging segmentation and paging can lead to increased complexity in memory management algorithms and hardware support. Additionally, designing a combined scheme that effectively leverages the benifits of both techniques requires careful consideration and planning. Hence ~~combing~~ combining segmentation and paging can provide a ~~b~~ balance between the benifits of each technique, offering flexibility, protection, ~~effecti~~ efficient memory allocation and large address space management. This approach can be especially valuable in scenarios where both techniques advantages are desired, and the drawbacks of each can be mitigated through their combination

3 Write a program that implements the FIFO and LRU page-replacement algorithms presented in this chapter. First, generate a random page reference string where page numbers range from 0 to 9. Apply the random page-reference string to each algorithm, and ~~num~~ record the number of page faults incurred by each algorithm. Implement the replacement algorithms so that the number of page frames can vary from 1 to 7. Assume that demand paging is used

Here a python program that implements the FIFO (First-In-First-Out) and LRU (Least Recently Used) page-replacement algorithms for varying numbers of page frames. The program generates a random page reference string and applies it to each algorithm, recording the number of page faults incurred by each.

```
import random
from collections import deque
def fifo(page_reference_string, num_frames):
    page_frames = deque(maxlen = num_frames)
    page_fault = 0
    for page in page_reference_string:
        if page not in page_frames:
            page_frame.append(page)
            page_fault += 1
            print(f"page {page} loaded into frames :
                {list(page_frames)}")
    return page_faults
def lru(page_reference_string, num_frames):
    page_frames = [ ]
    page_fault = 0
    for page in page_reference_string:
        if page in page_frames:
            page_frames.remove(page)
        else:
            if len(page_frames) >= num_frames:
                page_frames.pop(0)
            page_fault += 1
            page_frames.append(page)
            print(f"page {page} loaded into frames:
                {page_frames}")
    return page_faults
```

```
def main():
    random.seed(42) # Set seed for reproducibility
    page_reference_string = [random.randint(0, 9) for _ in range(20)]

    for num_frames in range(1,8):
        print(f"Number of Page Frames: {num_frames}")
        print("FIFO:")
        fifo_faults = fifo(page_reference_string, num_frames)
        print(f"Total page Faults (FIFO): {fifo_faults}\n")
        print("LRU:")
        lru_fault = lru(page_reference_string, num_frames)
        print(f"Total Page Faults (LRU): {lru_faults}\n")

if __name__ == "__main__":
        main()
```

In this program the 'fifo' function implements the FIFO page-replacement algorithm using a deque to represent the page frames. The 'lru' function implements the LRU page replacement algorithm using a list to keep track to page frames' order. The 'main' function generates a random page reference string and tests both algorithms with varying numbers of page frames.

We can run this program to observe how the number of page fault changes for different page frame size using the FIFO and LRU algorithm. Therefore the actual outputs or results might vary due to the randomness of the generated page reference string.

4 What are the advantages and disadvantages of recording the name of the creating program with the file's attributes (as is done in the Macintosh operating system)?

Advantages:

1) Contextual Information:

Storing the name of the creating program alongside a file's attributes provides valuable contextual information. This information helps users and administrators understand the origin and purpose of the file without needing to open it or check external documentation

2) Accountability:

knowing which program created a file can help with accountability. In a shared environment or multi-user system, if a file causes issues or requires updates, it's easier to identify the responsible program or user. This can streamline troubleshooting and maintenance

3) Version Tracking:

If the creating program's name is associated with version information, it can aid in tracking changes and compatibility. user can quickly identify which program versions were used to create or modify the file

4) Interoperability:

In environments where different software applications interact with files, recording the creating program can help ensure compatibility and smoother interactions. If an application understands the source program's name, it might optimize its behaviour accordingly.

5) User Experience:

From a user experience standpoint, associating the creating programs name with a file can help users organize and manage their files more effectively. It enables users to quickly identify which files belong to certain applications

Disadvantages :

1) Privacy Concerns :

Recording the name of the creating program might inadvertently reveal sensitive information about the user's activity. This could be a concern if users expect a certain degree of privacy or if certain files contain confidential data.

2) Data Bloat :

Adding metadata like the program's name to file attributes can increase the size of the metadata associated with each file. This might not be an issue for individual files, but in situations with a large number of files, it could contribute to unnecessary storage overhead.

3) Maintenance Overhead :

Overtime, software applications might get updated, renamed, or become obsolete, maintaining accurate problem names associated with files can become challenging, especially in environments with frequent software changes.

4) Misleading Information :

If a file was created using a temporary or generic program, associated that program's name with the file could be misleading. users might assume that the file is more important or significant that it actually is

5) File Migration and sharing :

When files are moved between systems, platforms or software versions the program names might not be recognized or might change due to differences in naming conversions of or software availability. This can lead to confusion and compatibility issues.

5 Discuss the relative advantages and disadvantages of sector sparing and sector slipping.

Sector sparing and sector slipping are two techniques used in data storage and management, particularly in the context of hard disk drives (HDDs). These techniques are employed to deal with bad sectors on a disk and ensure data integrity Let's discuss the relative advantages and disadvantages of each

1, Sector Sparing :

Advantages:

1. Data Integrity : Sector sparing helps maintain data integrity by relocating data from a bad sector to a reserved spare sector on the disk. This ensures that the data remains accessible and readable even if there are a few bad sector on the drive

2. Automate process : Sector sparing is often an automated process that doesn't require user intervention. This drive firmware handles the relocation of data from bad sectors to spare sectors, making it convenient for users.

3. Extended Drive lifespan : By reallocating data from bad sectors sector sparing can extend the lifespan of the HDD because it reduces its risk of further damage of the data.

4. Transparent of users : Users typically do not notice sector sparing in action. The drive's firmware handles everything in the background, minimizing disruptions.

Disadvantages:

1, Limited Spare Sectors : HDDs have a limited number of spare sectors available for sector sparing. If too many bad sectors develop, the drive may eventually run out of spare sectors, making it more challenging to maintain data integrity

2, Performance Impact : The process of relocating data from a bad sector to a spare sector can impact drive performance, causing slower read or write operations during the relocation process.

2. Sector Slipping

Advantage

1. Data Recovery : Sector slipping allows for the recovery of some data from a damaged sector by attempting to skip over the ~~on~~ bad sector and retrieve the next available sector ~~sp~~ This can be useful when you don't have spare sectors left for sector sparing

2. Better Performance : In cases where only a few bad sectors exist, sector slipping may provide better overall performance compared to sector sparing as it doesn't involve the data relocation process

Disadvantage

1, Data loss : sector slipping may result in partial or complete data loss for the sectors affected by bad sector. It's not a guaranteed method for data recovery, and some data may remain inaccessible.

2, Risk of Further Damage : Continuing to use a drive with bad sectors and relying on sector slipping may increase the risk of further damage to the drive, potentially leading to more data loss

3. User Intervention : sector slipping often requires manual intervention or the use of specialized software, making it less convenient for average users

4. Reduced Data Integrity : Unlike sector sparing, sector slipping doesn't guarantee data integrity. It's a last-resort method when spare sector are exhausted

Ans
8/9/25

20/20

PROGRAM OUTCOMES (POs)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Desigr./development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOS)	
PSO1	understand, Analyse & demonstrate the knowledge of human cognition AI, ML in terms of real world problems to meet challenges of future
PSO2	Incorporate AI & ML techniques for industrial applications in the area of Autonomous system, IOT, cloud computing, Robotics, emerging area
PSO3	Develop computational knowledge & project development skill using innovative tools & techniques to solve problems in the area of AIML
PSO4	Provide solutions to complex problem using the latest hardware software tools along with analytical skill to arrive at cost effective
PROGRAM EDUCATIONAL OBJECTIVES (PEOS)	
PEO1	Expand knowledge in the field of AIML
PEO2	Develop a continuous learning attitude & ethics and values
PEO3	self-Educate and expand to the innovative entrepreneurship dimension
PEO4	provide solution for technical and social problems through research and innovation.

ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY

(A Unit of Alva's Education Foundation)
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Phone : 08258 - 262725, Fax : 08258 - 262726
(Affiliated to VTU Belagavi, Approved by AICTE, New Delhi, Recognized by Govt. of Karnataka)

ASSIGNMENT BOOK

Branch : Information Science & Engineering

Assignment Number	Date of Submission	Maximum Marks / Marks Obtained	Signature of the Student with Date	Signature of the Teacher with Date
1	22/06/23	10	Sapthami 22/06/23	
2	24/07/23	10	Sapthami 24/07/23	
3				
4				
5				
Total Marks				
Average Assignment Marks				
Marks in words :				

Name : Sapthami

USN : 4AL21IS042

Sem. & Section : IV Sem & A Sec

Subject Name / Code : Microcontroller & Embedded system | 21CS43

Submitted to Prof. : Ms. Lolakshi P.K

Assignment Marks 20 / Max. Marks 20

Signature of Faculty

VISION OF THE INSTITUTE

"Transformative education by pursuing excellence in Engineering and Management through enhancing skills to meet the evolving needs of the community

MISSION OF THE INSTITUTE

- To bestow quality technical education to imbibe knowledge, creativity and ethos to students community.
- To inculcate the best engineering practices through transformative education.
- To develop a knowledgeable individual for a dynamic industrial scenario.
- To inculcate research, entrepreneurial skills and human values in order to cater the needs of the society.

VISION OF THE DEPARTMENT

To impart quality learning & nurture students to become succesful technocrats by achieving excellence in information Science and engineering field for addressing the evolving needs of the industry as well as the society.

MISSION OF THE DEPARTMENT

M1. To provide quality technical education & research training for preparing competent professional in information technology.

M2. To provide the suitable infrastructure and environment that inculcates best engineering practices for the socio economic development

M3. To foster the students to become successful technocrats to meet the global competency in the field of IT industry.

M4. To develop entrepreneurship skills with active research & innovation by inculcating ethical values among students.

COURSE OUTCOMES

CO1	Explain C - compiler & optimisation
CO2	Describe the ARM microcontroller architectural features and program module.
CO3	Apply the knowledge gained from programming of ARM to different applications.
CO4	Program the basic hardware components & their application Selection method
CO5	Demonstrate the need for a real-time operating system for embedded system application.
CO6	

1)

Microprocessor	Microcontroller
• Do not have RAM, ROM and I/O devices	• It is all in one ~~processor~~ contains RAM, ROM & I/O devices together in controller.
• uses pins as bus to interface with RAM, ROM & I/O devices.	• Buses are Interconnected in microcontroller.
• Microprocessor has power saving system.	• It does not have power saving system.
• cost is expensive because external component are needed.	• Cheap compared to Microprocessor.
• Instruction speed is of 1 GHZ	• Instruction speed is of 8MHZ to 50 MHZ
• Data & memory are stored in same module	• Data & memory are stored as separate.

PROGRAM OUTCOMES (POs)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOS)	
PSO1	Apply the knowledge of computer networking database & computations to provide the solutions to the real world engineering problems.
PSO2	Design, develop, test and maintain the software system that satisfy the needs of the IT industry.
PSO3	Develop programs and projects using different modern software tools for industrial & scientific applications.
PSO4	
PROGRAM EDUCATIONAL OBJECTIVES (PEOS)	
PEO1	Apply the principles of Information Science & Engineering & fundamentals of mathematics to provide solutions to the societal needs
PEO2	Pursue higher education and engage in research to meet the challe of the latest technologies
PEO3	Design & develop reliable software systems to satisfy the industrial needs through multidisciplinary projects.
PEO4	Able to work in various IT related field & contribute to the society.

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ASSIGNMENT BOOK

Branch : Electronics and Communication

Assignment Number	Date of Submission	Maximum Marks 10 / Marks Obtained	Signature of the Student with Date	Signature of the Teacher with Date
1	1/06/2023	10	Ramya .K. 1/6/2023	
2	28/06/2023	9	Ramya .K. 28/06/2023	
3	04/07/23	10	Ramya .K. 4/07/23	
4	Applied Ascy	3 10		
5		3		
Total Marks		39		
Average Assignment Marks		10		

Marks in words : One zero

Name : RAMYA . K.

USN : 4AL20EC041

Sem. & Section : 6th & A

Subject Name / Code : Embedded Systems / 18EC62

Submitted to Prof. : Mrs. Ansha Prathibha

Assignment Marks 10 / Max. Marks 10

Signature of Faculty

VISION OF THE INSTITUTE

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- To inculcate research, entrepreneurial skills and human values in order to cater the needs of the society.

VISION OF THE DEPARTMENT

"Center of excellence to empower to young minds to the field of electronics and communication with research focus and skill development through transformation education, catering to the needs of the society"

MISSION OF THE DEPARTMENT

- TO Create unique learning environment to enable the students for their excellence
- TO empower the students with necessary skills for solving the technological problems.
- TO promote R & D activities among teaching learning grp to the requirement for industry/academic
- By imbibing the students with human values & ethic through transformative education & make them socially responsible.

COURSE OUTCOMES

CO1	Apply the knowledge of architectural features & instructions of 32 bit microcontroller ARM cortex
CO2	Apply the knowledge gained for programming ARM Cortex M3 for different applications
CO3	Analyze the basic hardware components & their selection method based on the characteristics
CO4	Develop the hardware & software co-design & firmware design approaches
CO5	Apply the knowledge of real time OS for ES application.
CO6	

PROGRAM OUTCOMES (POs)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
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PROGRAM SPECIFIC OUTCOMES (PSOS)	
PSO1	Understand and apply the principles of ECE in various domains of Analog & Digital Systems
PSO2	Design & Implement system using the concepts of Electronics, Signal processing, Embedded system & semiconductor technology
PSO3	Apply modern Hardware & Software tools to analyze and solve engineering problem
PSO4	
PROGRAM EDUCATIONAL OBJECTIVES (PEOS)	
PEO1	Apply the mathematical, scientific & Engineering skills for solving problems in the area of ECE.
PEO2	Expose to emerging technologies & excel in industries/Higher studies/Research
PEO3	apply analytical skills in the area of ECE to become competent and employable.
PEO4	Inculcate professional ethics, human values team work for solving engineering problems.