BIJAY REGMI(210913032)

WEEK 5

DATE - 20/12/2021

1. HAMMING CODE

```
#include<stdio.h>

int powerOf(int base, int e){
    int prod = 1;
    while(e != 0){
        prod = prod*base;
        e--;
    }
    return prod;
}

int checkPowerOfTwo(int num){
    int i = 0, powTwo;
    while(i!=100){
        powTwo = (int)powerOf(2,i);
        if(num == powTwo)
            return 1;
        else if(num < powTwo)
            return 0;
        i++;
    }
    return 0;
}

int calculateRedudentBits(int n){
    int r=1,temp;
```

```
    while(r!=100){
        temp = (int)powerOf(2,r);
        if(temp>=(n+r+1))
            return r;
        r++;
    }
    return 0;
}

int main(){
    char s1[100];
    int N=0, R, i, j, k, l, parity;

    printf("\n\nSENDING SITE");
    printf("\n----------\n\n");

    printf("\nEnter data to send : ");
    gets(s1);
    while(s1[N] != '\0')
        N++;

    // Calculating Redundent Bits
    R = calculateRedudentBits(N);
    printf("\n\nRedundent Bits : %d", R);

    int data[N], dataWord[N+R];
    // Converting string data to int data in REVERSE
    i = N-1;
    j=0;
    while(j != N){
        data[i] = s1[j]-'0';
        i--; j++;
    }

    // Creating DataWord in REVERSE
    j=0;
    for(i=0; i < N+R; i++){
        if(checkPowerOfTwo(i+1))
            continue;
        dataWord[i]=data[j];
```

```
    j++;
}
printf("\nParity Bits : ");
for(i=0; i < R; i++){   //Looping for Redundent Bits
    j = powerOf(2,i);
    parity = 0;
    for(k=j-1; k<N+R ; k+=(2*j)){   //Skipping j number of bits

        l = k;
        while(l<k+j && l<N+R){      //considering even parity of l number of bits
            if(l != j-1)
                parity = parity^dataWord[l];
            l++;
        }
    }
    dataWord[j-1] = parity;
    printf("\t     Dataword[%d] : %d",j,dataWord[j-1]);
}

// Reversing Dataword to original form.
printf("\nDATAWORD : ");
i=N+R-1;
while(i>=0){
    printf("%d",dataWord[i]);
    i--;
}


printf("\n\n\nRECIEVING SITE");
printf("\n----------\n\n");



char s2[100];
int n;
// Recieving Dataword and checking whether the dataword has same length on sending site or not.
while(n != N+R){
    printf("\nEnter data Recieved : ");
    gets(s2);
    n=0;
```

```
    while(s2[n] != '\0')
        n++;
    if(n != N+R)
        printf("\nERROR !\nDataword Recieved length is not equal to dataword sent. \n");
}

int dataWordRecieved[100],rbits[100],rbitsLength;

printf("\nDataword Recieved : ");
// Converting Recieved string dataWord to int dataWord in REVERSE
i = n-1;
j=0;
while(j != n){
    dataWordRecieved[i] = s2[j]-'0';
    printf("%d",dataWordRecieved[i]);
    i--; j++;
}


// Finding all redundent bits from dataWordRecieved[100] and storing it in rbits[100]
j=0;
for(i=0; i < n; i++){
    if(checkPowerOfTwo(i+1))
        j++;
}
rbitsLength = j;

// Looping through redundent bits to find error bits
// Checking Parity for every redundent bits and storing parity in rbits[100]
for(i=0; i < rbitsLength; i++){   //Looping for Redundent Bits
    j = powerOf(2,i);
    parity = 0;
    for(k=j-1; k<n ; k+=(2*j)){   //Skipping j number of bits

        l = k;
        while(l<k+j && l<n){      //considering even parity of l number of bits
            parity = parity^dataWordRecieved[l];
            l++;
        }
    }
```

```
    rbits[i] = parity;
}

// Checking whether all redundent bits are 0 or not;
// If not 0, the calculating position
printf("\nRedundent bits Recieved : ");
j=rbitsLength-1;
int position = 0;
while(j>=0){
    printf("%d",rbits[j]);
    if(rbits[j] == 1){
        position = position + powerOf(2,j);
    }
    j--;
}

if(position == 0){
    printf("\nThere is no error in recieved Dataword ");
    for(i=0; i<n; i++)
        printf("%c",s2[i]);
}
else{
    printf("\nThere is error in position %d",position);
    if(dataWordRecieved[position-1] == 0)
        dataWordRecieved[position-1] = 1;
    else
        dataWordRecieved[position-1] = 0;
    printf("\nCORRECTED DATAWORD : ");
    i = n-1;
    while(i>=0){
        printf("%d",dataWordRecieved[i]);
        i--;
    }
}

// Printing Recieved Data
printf("\n\nRECIEVED DATA : ");
for(i=n-1; i >= 0; i--){
    if(checkPowerOfTwo(i+1))
        continue;
```

```
        printf("%d",dataWordRecieved[i]);
    }



    printf("\n\n");
    return 0;
}
```

INPUT/OUTPUT

```
Student@dblab-hp-02:~/210913032/Week5$ gcc hammingCode.c
hammingCode.c: In function 'main':
hammingCode.c:44:5: warning: implicit declaration of function 'gets' [-Wimplicit-function-declaration]
     gets(s1);
     ^
/tmp/ccB1Plel.o: In function `main':
hammingCode.c:(.text+0x132): warning: the `gets' function is dangerous and should not be used.
Student@dblab-hp-02:~/210913032/Week5$ ./a.out


SENDING SITE
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Enter data to send : 1011001


Redundent Bits : 4
Parity Bits :       Dataword[1] : 0         Dataword[2] : 1         Dataword[4] : 1         Dataword[8] : 0
DATAWORD : 10101001110


RECIEVING SITE
-------------


Enter data Recieved : 10101101110

Dataword Recieved : 10101101110
Redundent bits Recieved : 0110
There is error in position 6
CORRECTED DATAWORD : 10101001110

RECIEVED DATA : 1011001

Student@dblab-hp-02:~/210913032/Week5$
```

2. FIFO Packet Scheduling Mechanism

```
#include<stdio.h>
#include<stdlib.h>


# define MAX 3


// Structure of Queue
```

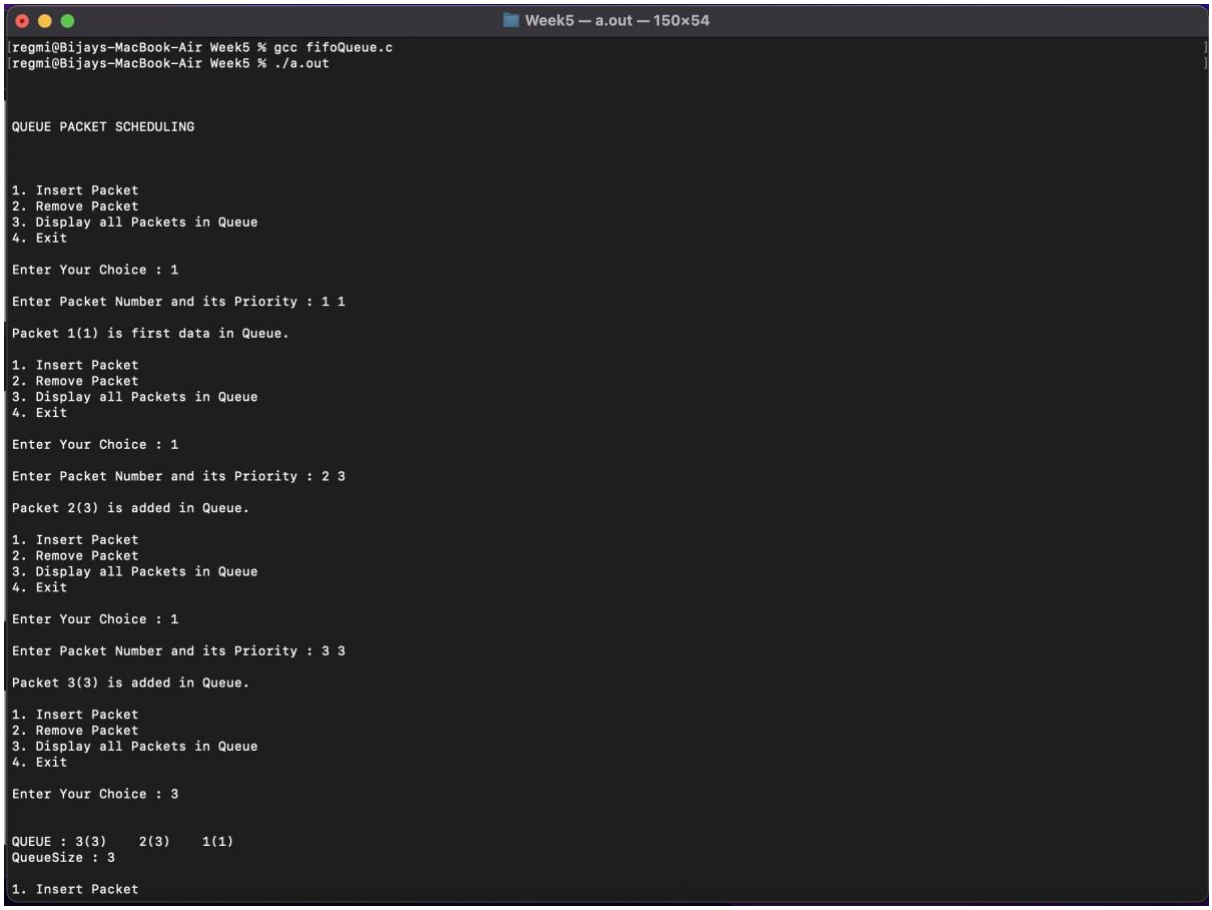
```c
typedef struct Queue{
    int data;
    int priority;
    struct Queue *left, *right;
}queue;

queue *head = NULL;
queue *tail = NULL;
queue *minPriority = NULL;
int queueSize = 0;

// Creates a new Node
queue* createNode(int data, int priority){
    queue *newNode = (queue*)malloc(sizeof(queue));
    newNode->data = data;
    newNode->priority = priority;
    newNode->left = NULL;
    newNode->right = NULL;
    return newNode;
}
// Checks Whether Queue is Empty Or Not
int isQueueEmpty(){
    if(head == NULL && tail == NULL){
        printf("\nERROR ! Queue is Empty.");
        return 1;
    }
    return 0;
}
// Finds next Min Priority
queue* findMinPriority(){
    if(head != NULL && tail != NULL){
        queue *temp = tail->right, *minPriority=tail;
        while (temp){
            if(minPriority->priority > temp->priority)
                minPriority = temp;
            temp=temp->right;
        }
        return minPriority;
    }
    return NULL;
```

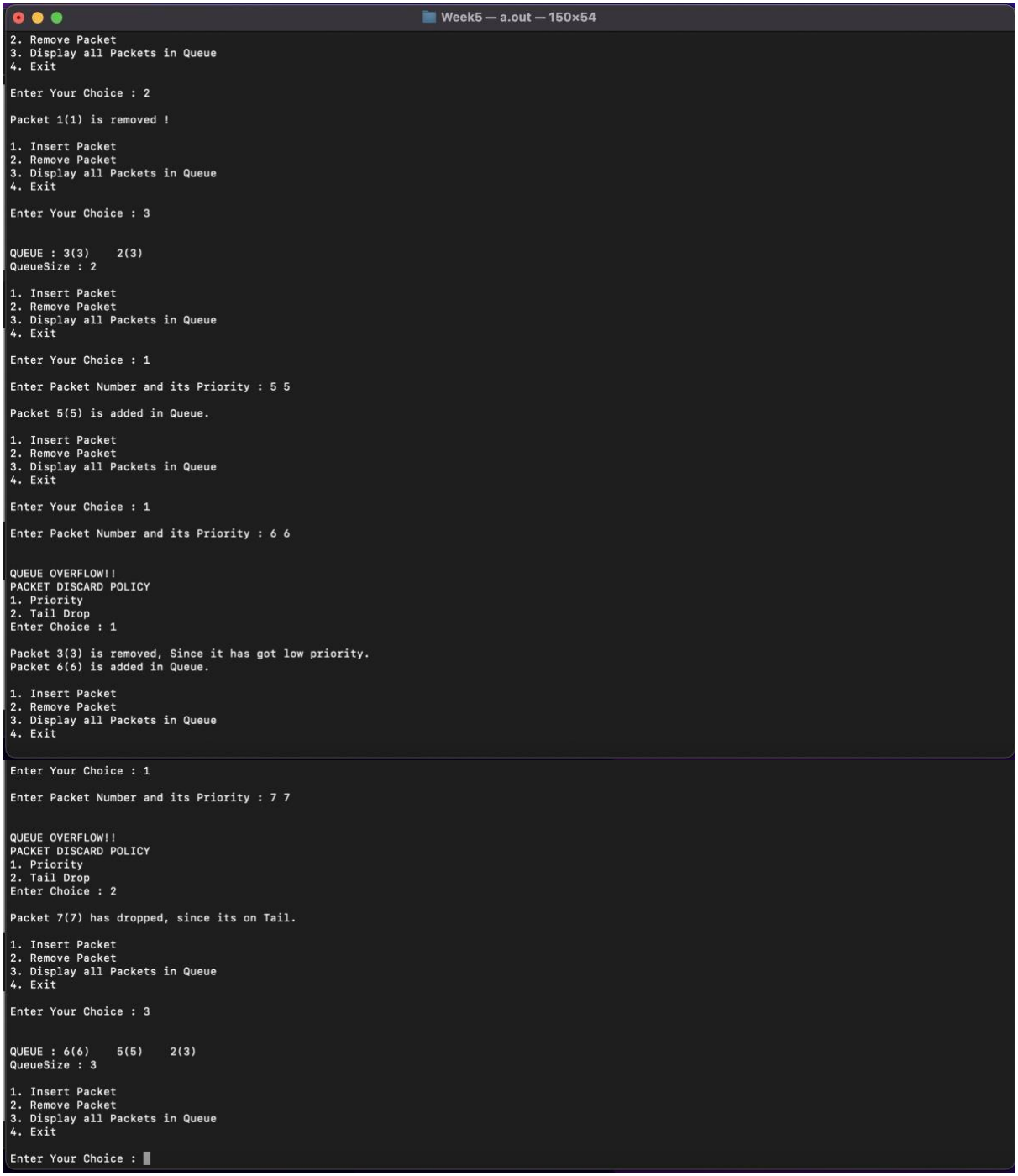
```
}
// Discard min priority and adds upcoming
void priorityDiscardPolicy(queue *newNode ){
    // Removing Min Priority
    if(minPriority->left)
        minPriority->left->right = minPriority->right;
    if(minPriority->right)
        minPriority->right->left = minPriority->left;
    printf("\nPacket %d(%d) is removed, Since it has got low priority.",minPriority->data,minPriority->priority);
    queue *temp = minPriority;
    free(temp);
    minPriority = findMinPriority();
    // Adding NewNode to tail
    if(minPriority->priority > newNode->priority)
        minPriority = newNode;
    newNode->right = tail;
    tail->left = newNode;
    tail = tail->left;
    printf("\nPacket %d(%d) is added in Queue.",tail->data,tail->priority);
}
// Enter value in tail
void enqueue(int data, int priority){
    queue *newNode = createNode(data,priority);
    if(head == NULL && tail == NULL){
        head = newNode;
        tail = newNode;
        minPriority = newNode;
        queueSize ++;
        printf("\nPacket %d(%d) is first data in Queue.",tail->data,tail->priority);
        return;
    }
    if(queueSize == MAX){
        int ch;
        printf("\n\nQUEUE OVERFLOW!!\nPACKET DISCARD POLICY\n1. Priority\n2. Tail Drop\nEnter Choice : ");
        scanf("%d",&ch);
        if(ch==1){
            priorityDiscardPolicy(newNode);
            return;
        }
        else if(ch == 2){
```

```
            printf("\nPacket %d(%d) has dropped, since its on Tail.",newNode->data,newNode->priority);
            free(newNode);
            return;
        }
    }
    if(minPriority->priority > newNode->priority)
        minPriority = newNode;
    newNode->right = tail;
    tail->left = newNode;
    tail = tail->left;
    queueSize ++;
    printf("\nPacket %d(%d) is added in Queue.",tail->data,tail->priority);
}
// Delete value from head
void dequeue(){
    if(!isQueueEmpty()){
        queue *temp = head;
        if(head == tail){
            head = NULL;
            tail = NULL;
        }
        else{
            head = head->left;
            head->right = NULL;
        }
        if(minPriority == temp )
            minPriority = findMinPriority();
        printf("\nPacket %d(%d) is removed !",temp->data,temp->priority);
        queueSize -- ;
        free(temp);
    }
}
// Displays queue
void display(){
    queue *temp=tail;
    printf("\n\nQUEUE : ");
    while (temp){
        printf("%d(%d)\t",temp->data,temp->priority);
        temp = temp->right;
    }
```

```
    printf("\nQueueSize : %d",queueSize);
}

int main(){
    printf("\n\n");
    int ch=0, data, priority;
    printf("\nQUEUE PACKET SCHEDULING\n\n");
    while(ch != 5){
        printf("\n\n1. Insert Packet\n2. Remove Packet\n3. Display all Packets in Queue\n4. Exit\n\nEnter Your
Choice : ");
        scanf("%d",&ch);
        if(ch == 1){
            printf("\nEnter Packet Number and its Priority : ");
            scanf("%d", &data);
            scanf("%d", &priority);
            enqueue(data, priority);
        }
        else if(ch==2)
            dequeue();

        else if(ch ==3)
            display();

        else if(ch == 4)
            break;
        else
            printf("\n\nERROR ! Invalid Input.");
    }

    printf("\n\n");
    return 0;
}
```

INPUT/OUTPUT


Week5 — a.out — 150×54
regmi@Bijays-MacBook-Air Week5 % gcc fifoQueue.c
regmi@Bijays-MacBook-Air Week5 % ./a.out
QUEUE PACKET SCHEDULING
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 1 1
Packet 1(1) is first data in Queue.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 2 3
Packet 2(3) is added in Queue.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 3 3
Packet 3(3) is added in Queue.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 3
QUEUE : 3(3) 2(3) 1(1)
QueueSize : 3
1. Insert Packet


Week5 — a.out — 150×54
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 2
Packet 1(1) is removed !
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 3
QUEUE : 3(3) 2(3)
QueueSize : 2
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 5 5
Packet 5(5) is added in Queue.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 6 6
QUEUE OVERFLOW!!
PACKET DISCARD POLICY
1. Priority
2. Tail Drop
Enter Choice : 1
Packet 3(3) is removed, Since it has got low priority.
Packet 6(6) is added in Queue.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 1
Enter Packet Number and its Priority : 7 7
QUEUE OVERFLOW!!
PACKET DISCARD POLICY
1. Priority
2. Tail Drop
Enter Choice : 2
Packet 7(7) has dropped, since its on Tail.
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice : 3
QUEUE : 6(6) 5(5) 2(3)
QueueSize : 3
1. Insert Packet
2. Remove Packet
3. Display all Packets in Queue
4. Exit
Enter Your Choice :