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ASSIGNMENT - 07

**Q1. Construct the Moore Machine that taken all strings a's and b's as input and the output is 1 if the input end with'ab' output is 2 if the input ends with 'aa' otherwise the output is 0.**

Ans:- #include <stdio.h>

```
int moore_machine(char input[]) {
    int state = 0; // initial state is S0
    int i = 0;
    while (input[i] != '\0') { // loop through input string
        if (input[i] == 'a') {
            if (state == 0) {
                state = 1;
            } else if (state == 1) {
                state = 2;
            } else {
                state = 1;
            }
        } else { // input[i] == 'b'
            if (state == 0) {
                state = 0;
```

```c
        } else if (state == 1) {
            state = 0;
        } else {
            state = 0;
        }
    }
    i++;
    }
    // determine output based on final state
    if (state == 1) {
        return 2;
    } else if (state == 2) {
        return 1;
    } else {
        return 0;
    }
}

int main() {
    char input[100];
    printf("Enter input string: ");
    scanf("%s", input);
    int output = moore_machine(input);
    printf("Output: %d\n", output);
    return 0;
}
```
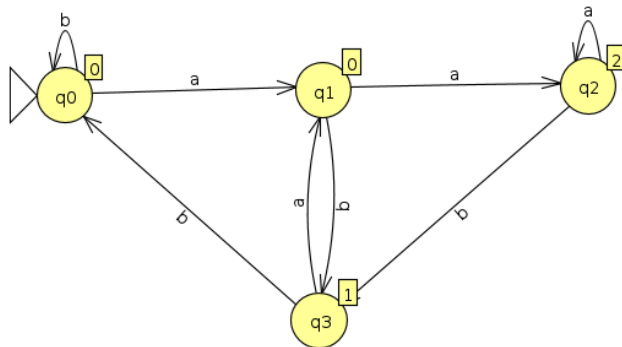
Q2) Construct a mealey machine to print the remainder when no. of base 4 is divisible by 3.

ANS:-

#include <stdio.h>

```
int main() {
    int state = 0; // start in state A
    char digit;

    printf("Enter a number in base 4: ");

    while (scanf("%c", &digit) == 1 && digit != '\n') {
        switch (digit) {
            case '0':
                printf("%d", state); // output current remainder
```

```c
            state = 0; // update state
            break;
        case '1':
            printf("%d", state);
            state = 1;
            break;
        case '2':
            printf("%d", state);
            state = 2;
            break;
        case '3':
            printf("%d", state);
            state = (state + 1) % 3; // update state based on Mealy
machine table
            break;
        default:
            printf("Invalid input: %c\n", digit);
            return 1;
        }
    }

    // output final remainder
    printf("%d\n", state);

    return 0;
}
```
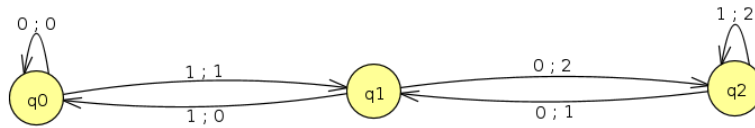
```
0 ; 0                                          1 ; 2
                    1 ; 1            0 ; 2
   q0               q1               q2
                    1 ; 0            0 ; 1
```

Q3) Construct a mealey machine that takes binary number as a input and produce 2's complement of that number as output assume the string is read from least significant bit(LSB)to most significant bit(MSB)and carry is discarded.

Ans:-
#include <stdio.h>

```c
int main() {
    int state = 0; // start in state A
    char digit;

    printf("Enter a binary number (LSB to MSB): ");

    while (scanf(" %c", &digit) == 1 && digit != '\n') {
        switch (digit) {
            case '0':
```

```c
        switch (state) {
            case 0:
                printf("0"); // output 0 for A state
                break;
            case 1:
                printf("1"); // output 1 for A state with carry
                break;
            case 2:
                printf("1"); // output 1 for B state
                break;
            default:
                printf("Error: Invalid state\n");
                return 1;
        }
        state = 0; // update state
        break;
    case '1':
        switch (state) {
            case 0:
                printf("1"); // output 1 for A state
                state = 1;
                break;
            case 1:
                printf("0"); // output 0 for A state with carry
                state = 2;
                break;
            case 2:
                printf("0"); // output 0 for B state
                state = 2;
                break;
            default:
                printf("Error: Invalid state\n");
                return 1;
        }
        break;
    default:
```

```c
            printf("Invalid input: %c\n", digit);
            return 1;
        }
    }

    // output final stage of 2's complement calculation
    switch (state) {
        case 0:
            printf("1\n"); // output -1 for input of all zeros
            break;
        case 1:
            printf("0\n"); // output 0 for input of all ones
            break;
        case 2:
            printf("1\n"); // output -1 for any other input
            break;
        default:
            printf("Error: Invalid state\n");
            return 1;
    }

    return 0;
}
```