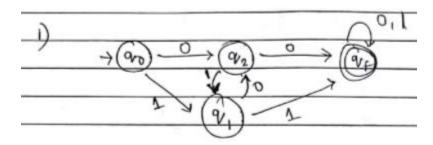
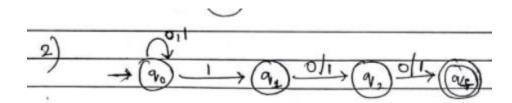
## Problem 1

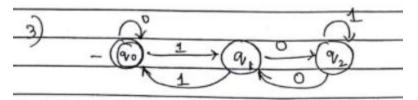
1. All binary numbers that contain 00 or 11



2. All binary numbers that contain a 1 in the 3rd location from the right (e.g.100, 10111, ...)



## 3. All binary numbers that can be divided by 3



## Problem2

Via subset construction, construct DFAs from all three NFAs that were constructed in problem 1.Please show step-by-step solutions.

```
Step1 create transition table -
      State
                 0
                          20,21
             90,93
           73 +94
          +94 -94
                         +92
Let Q' be a new set of States for DFA. Let T' be new transition table
Step-2: Add toansition of 90 to T'
     State o t
     → 20 Sacrad [20,21]
                               8' ( 990,933,0) = 8(90,0) 08(98,0)
Step3 new state -> 990,933
                                     = {90,93,94}
 . Add 'H to T!
                         S'(200,233,1) = S(20,1) US(23,1)
state 0
-90 fao.43 fao.4.3
                                   = {90,9,3
      [90,95] [90,95,94] {70,913
 stopy: new state -> { 901713 to add it to T'
                                   8'( 290,7,7,0). 8(20,0) 48(21,0)
       State
              0
      70 120,933 Sac,9,3
                                           = 320,235
                               8 (220,213,0) = 8 (20,0) US (21,1)
      [90,93] [90,93,94] [90,21]
```

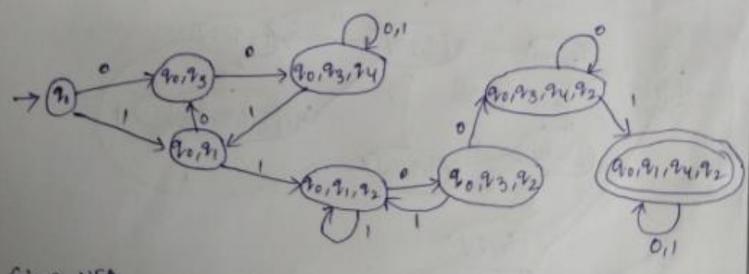
{20,2,3

290,987 - {90,9192}

- 320,21,22}

Step 5: new State 190,93,943 add it to T' 81 (190, 93,943,0) -8 (20,0) 08 (230) state 0 -> 90 Equasis 291,913 US(940) 990,913 [90,90] }20,90,90f = 3 90193,943 140,81,923 390,907 {90,98} 8 (190, 93, 943, 1) -8 (90,0) 46 (93,1) U8(941) = 20098 1941 Step 6: now state { 90, 9, , 92} add it to T' Stak 0 8'({90,91,923,0) = 8(90,0)0 -> 90 {90,93} {90,913 8(91,0) U8(920) 190,933 [90,93,943 190,913 = {90,93,92} {90,9,3 } 220,953 {90,9,192} 8'( {90,9,1923,1)=8(90,1) U8(9) 290,93,943 290,93,943 290,93,943 U 8 (92/1) = 290,91,923 [90,9,12] [20,93,92] [20,9,93] Step 71. new slate 3 90,90,923 add it to T' 8 (390,93,927,0) + 8 (90,0) 45 (25,0) State 290,213 -> 90 [90,95] 03(2,10) 220,908 30,99,943 820,21 = { 10,99 14,92} {20,93 £90,93} E90,91,925 8 (190,25,20) - 5 90,70,90 890,23,243 200, 93,943 890,93,749 [90,91,93] 290,93,933 590,91,929 190,93,94,923 220,23,22) 590,91,923

steps: new state 220,93,94,923 State 0 200,203 200,933 -> 90 8 90,93 4 9 20,9,3 290,93,947 390,933 390,9,328 290,9,3 990,92,943 220,93A43 390,95,943 そ20, 31,23 890,9,923 190,93,903 290,93923 [90,93,94,92] [70,9,123 220,93,94,923 [90,93,94,25] [90,91,24,23 {90,91,94,92} }90,9,74,72] } 90,9,94,92}



Given NFA state 0 90,91 90 900 91 23 92 9.5 93

2)

step 1 - new state (90,91)

State 0 1 -> 2. 9. 220,213 {20,213 \$0,21 } {20,21,20}

stopa 1. Moras 300,733 990,91,735

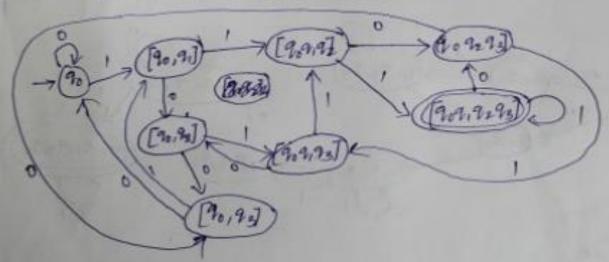
Stepa: 210,9,923 210,92,93 290,9,92,933

Step 4: {90,93} 90 {40,913

steps: {90,9,193} {70,73} {20,9,122}

Step6: [90, A2, 93] 390, 93] 390, 9,193]

Step 1: {20,9,12,13} {90,92,93} {90,9,19,193}



Step !: 0 Start Step 21 39,93 5 32,933 390,933 292,953 29,1933 [92,95] steps: 99,1933 [40,939 220,233 23. 93 Step71