EL-20136

COMPLEX ENGINEERING PROBLEM (CEP)

PROGRAMMING LANGUAGES(EL-255)

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Compiler used: **Turbo C++**

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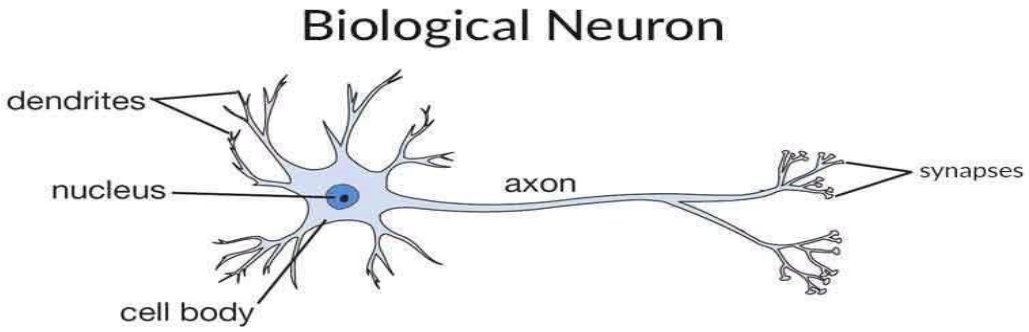
DEPARTMENT: ***ELECTRONIC***

COURSE: ***PROGRAMMING LANGUAGE (EL-255)***

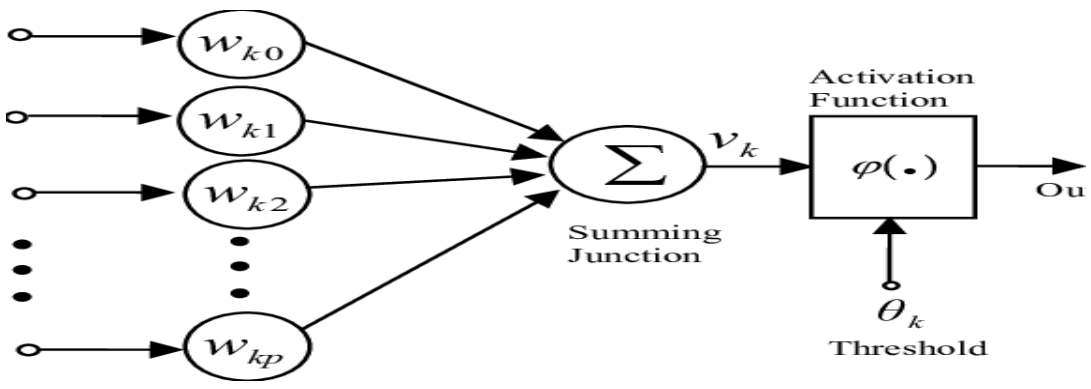
COMPLEX ENGINEERING PROBLEM (CEP)

STATEMENT: Train a two input AND gate using a single artificial neuron on the principle of Error Correction Learning (ECL) in C language.

BIOLOGICAL NEURON MODEL:



ARTIFICIAL NEURON MODEL:



MATHEMATICAL NEURON MODEL:

$$y_k = \varphi\left(\sum_{j=0}^{m} w_{kj} x_j\right)$$

CODE:

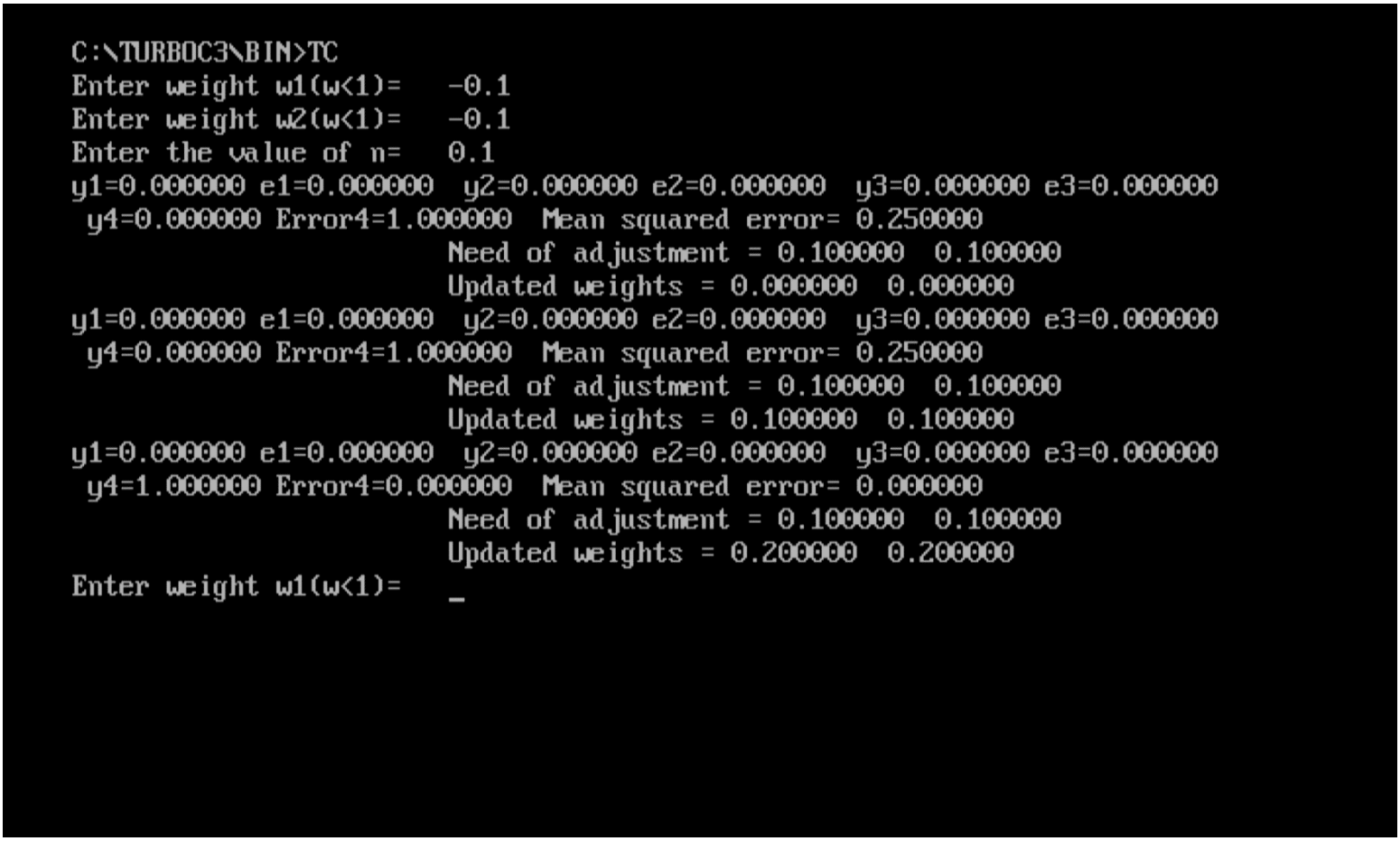
```
#include <stdio.h>
#include <conio.h>
#include <math.h>
int main()
{
   Float b=0.2,n,y1,y2,y3,y4,e1,e2,e3,Error4,j,deltaW1,deltaW2,w1,w2;
   Float x0=0,x1=1;
   int i=0;

   printf("Enter weight w1(w<1)=   ");scanf("%f",& w1);
   printf("Enter weight w2(w<1)=   ");scanf("%f",& w2);
   printf("Enter the value of n=   ");scanf("%f",& n);

   while(y4<1){
      y1= (w1*x0+w2*x0)+ b  ;
      if (y1<0){
         y1=0;}else{(y1=1);}
      e1= 0-y1;
      y2= (w1*x0+w2*x1)+ b  ;
      if (y2<0){
```

```
        y2=0;}else{(y2=1);}
    e2= 0-y2;
    y3= (w1*x1+w2*x0)+ b  ;
    if (y3<0){
        y3=0;}else{(y3=1);}
    e3= 0-y3;
    y4= (w1*x1+w2*x1)+ b  ;
    if (y4<0){
        y4=0;}else{(y4=1);}
    Error4= 1-y4;
    printf("y1=%f e1=%f  ", y1,e1);
    printf("y2=%f e2=%f  ", y2,e2);
    printf("y3=%f e3=%f  ", y3,e3);
    printf("y4=%f Error4=%f  ", y4,Error4);

    j = ((e1*e1)+(e2*e2)+(e3*e3)+(Error4*Error4))/4 ;
    printf("Mean squared error= %f\n",j);
    deltaW1= n*(x1*1);
    deltaW2= n*(x1*1);
    printf("\t\t\tNeed of adjustment = %f  %f \n",deltaW1,deltaW2);
    w1= w1+deltaW1;  w2= w2+deltaW2;
    printf("\t\t\tUpdated weights = %f  %f \n",w1,w2);
    }
  return 0;

}
```

```
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════ ASSIGNME.CPP ═══════════════1=[↕]
#include <stdio.h>
#include <conio.h>
#include <math.h>
int main()
{
float b=-0.2,n,y1,y2,y3,y4,e1,e2,e3,Error4,j,deltaW1,deltaW2,w1,w2,x0=0,x1=1;

    printf("Enter weight w1(w<1)=   ");scanf("%f",& w1);
    printf("Enter weight w2(w<1)=   ");scanf("%f",& w2);
    printf("Enter the value of n=   ");scanf("%f",& n);

    while(y4<1){
        y1= (w1*x0+w2*x0)+ b  ;
        if (y1<0){
            y1=0;}else{(y1=1);}
        e1= 0-y1;
        y2= (w1*x0+w2*x1)+ b  ;
        if (y2<0){
            y2=0;}else{(y2=1);}
        e2= 0-y2;
        y3= (w1*x1+w2*x0)+ b  ;
═══════ 1:17 ═══════
F1 Help  F2 Save  F3 Open  Alt-F9 Compile  F9 Make  F10 Menu
```

```
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════ ASSIGNME.CPP ═══════════════1=[↕]
        if (y3<0){
            y3=0;}else{(y3=1);}
        e3= 0-y3;
        y4= (w1*x1+w2*x1)+ b  ;
        if (y4<0){
            y4=0;}else{(y4=1);}
        Error4= 1-y4;
        printf("y1=%f e1=%f  ", y1,e1);
        printf("y2=%f e2=%f  ", y2,e2);
        printf("y3=%f e3=%f  ", y3,e3);
        printf("      y4=%f Error4=%f  ", y4,Error4);

        j = ((e1*e1)+(e2*e2)+(e3*e3)+(Error4*Error4))/4 ;
        printf("Mean squared error= %f\n",j);
        deltaW1= n*(x1*1);
        deltaW2= n*(x1*1);
        printf("\t\t\tNeed of adjustment = %f  %f \n",deltaW1,deltaW2);
        w1= w1+deltaW1;  w2= w2+deltaW2;
        printf("\t\t\tUpdated weights = %f  %f \n",w1,w2);
        }
    return(0);   }
═══════ 42:19 ═══════
F1 Help  F2 Save  F3 Open  Alt-F9 Compile  F9 Make  F10 Menu
```

OUTPUT:



Weights update till the error i.e. (Error4) is reduced from 1 to 0.