

A thick dark blue vertical bar runs down the left side of the page. A blue arrow-shaped banner points to the right from this bar, containing the text 'EL-20136'. Below the banner, several thin, curved lines in shades of blue and grey sweep upwards from the bottom left corner.

EL-20136

COMPLEX ENGINEERING PROBLEM (CEP)

PROGRAMMING
LANGUAGES(EL-255)

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Compiler used: Turbo C++

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ROLL NUMEBER: EL-20136 SEC 'A'

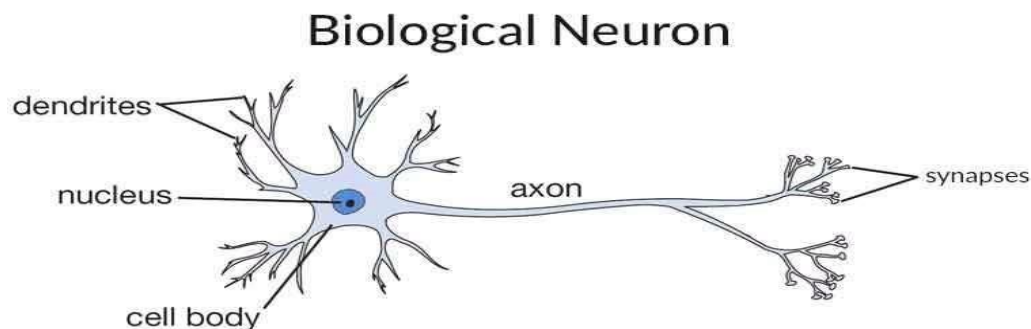
DEPARTMENT: ELECTRONIC

COURSE: PROGRAMMING LANGUAGE (EL-255)

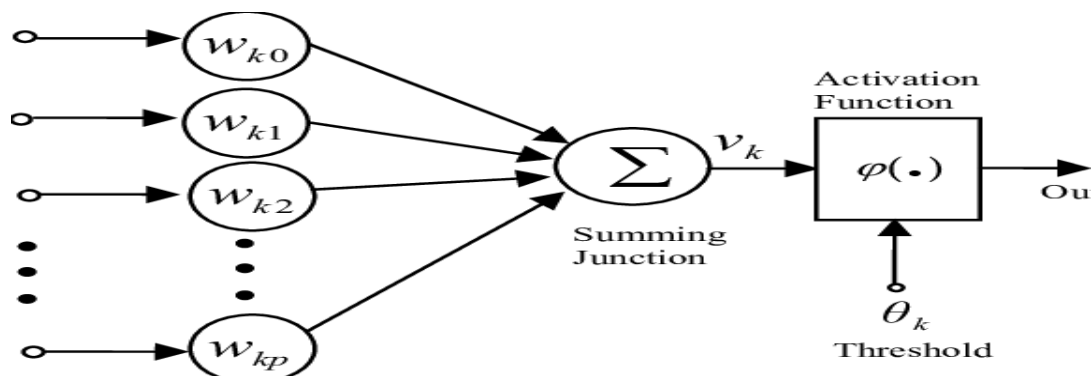
COMPLEX ENGINEERING PROBLEM (CEP)

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\tNeed of adjustment = %f %f \n",deltaW1,deltaW2);
w1= w1+deltaW1; w2= w2+deltaW2;
printf("\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
```

```
≡ 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
```

OUTPUT:

```
C:\TURBOC3\BIN>TC
Enter weight w1(w<1)= -0.1
Enter weight w2(w<1)= -0.1
Enter the value of n= 0.1
y1=0.000000 e1=0.000000 y2=0.000000 e2=0.000000 y3=0.000000 e3=0.000000
y4=0.000000 Error4=1.000000 Mean squared error= 0.250000
Need of adjustment = 0.100000 0.100000
Updated weights = 0.000000 0.000000
y1=0.000000 e1=0.000000 y2=0.000000 e2=0.000000 y3=0.000000 e3=0.000000
y4=0.000000 Error4=1.000000 Mean squared error= 0.250000
Need of adjustment = 0.100000 0.100000
Updated weights = 0.100000 0.100000
y1=0.000000 e1=0.000000 y2=0.000000 e2=0.000000 y3=0.000000 e3=0.000000
y4=1.000000 Error4=0.000000 Mean squared error= 0.000000
Need of adjustment = 0.100000 0.100000
Updated weights = 0.200000 0.200000
Enter weight w1(w<1)= -
```

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