

ภาคผนวก

1. โปรแกรมคอมพิวเตอร์ทำหน้าที่เป็นเครื่องอ่านอุณหภูมิโดยให้สารที่เตรียมได้เป็นหัววัด

```

Program Temperature_measurement;
uses crt;
var   i       : integer ;
      AV, T   : real ;
const PA      = $0304;
      Pcontrol = $0307;
begin
  clrscr;
  gotoxy (29,2) ; writeln('TEMPERATURE MEASUREMENT ');
  gotoxy (29,3) ; writeln('-----');
  port[Pcontrol]:= $90;
  for i := 1 to 9999 do
  begin
    DV := port[PA];
    gotoxy (27,12); writeln ('Digital Voltage(DV) = ',DV:3);
    delay(150);
    AV:=(5/255)*DV;
    gotoxy (24,16); writeln('Analog Volage(AV) = ',DV:3:3, 'V');
    delay(150);
    T := (16.117*AV*AV-21.649*AV);
    gotoxy(22,22); writeln('Measure Temperature(T) = ' T:3:2, 'deg C');
    delay(150);
  end;
end;

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2. โปรแกรมคอมพิวเตอร์ทำหน้าที่เป็นเครื่องควบคุมอุณหภูมิ

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Program Oven_Temperature_Controller;
uses crt;
var  ch      : char ;
     i , j ,AV,  : integer;
     AV, VT, T, Ts : real;
const PA      = $0304;
     PB      = $0305;
     Pcontrol = $0307;
begin
    port[Pcontrol] := $90;
    Ts := 0;
    port[PB] := 255;
    delay(100);
    port[PB] := 0;
    delay(100);
    clrscr;
    gotoxy (14,1) ; writeln('OVEN TEMPERATURE CONTROLLER ');
    gotoxy (14,2) ; writeln('-----');
    gotoxy (25,4) ; writeln('Setting Temperature = ', Ts:3:0);
    gotoxy (50,4) ; writeln(' C ');
    gotoxy (47,4); readln (Ts)
    repeat
        gotoxy (33,12) ; writeln(' OVEN START ');
        port[PB] := 255;
        delay(2000);
        sound (900); delay(10) ; nosound;
        gotoxy (29,15) ; writeln(' Reading Temperature ');
        DV := port[PA];
    until

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gotoxy (35,17); writeln (' DV = ',DV:3);
AV:=(5/255)*DV;
VT:=AV;
gotoxy (34,18); writeln('VT = ',VT:1:2, ' V ');
T := (-4.6799*VT*VT+75.099*VT);
gotoxy(34,22); writeln('T = ' T:3:2, 'deg C');
port[PB] :=0;
delay(500);
sound (9000); delay(10) ; nosound;
until T> Ts;
repeat
    sound (5000); delay(10) ; nosound;
    port[PB] :=255;
    delay(600);
until T> Ts-1;
for i:=1 to 1500 do
    begin
        repeat
            gotoxy (33,12) ; writeln(' OVEN START ');
            port[PB] :=0;
            sound (900); delay(10) ; nosound;
            gotoxy (29,15) ; writeln(' Reading Temperature ');
            DV := port[PA];
            gotoxy (35,17); writeln (' DV = ',DV:3);
            AV:=(5/255)*DV;
            VT:=AV;
            gotoxy (34,18); writeln('VT = ',VT:1:2, ' V ');
            T := (-4.6799*VT*VT+75.099*VT);
            gotoxy(34,22); writeln('T = ' T:3:2, 'deg C');

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        delay(200);
    until T < Ts;
repeat
    sound(5000); delay(90); nosound;
    port[PB] := 255;
    delay(1700);
until T > Ts-1;
end;
gotoxy(37,23); writeln(' Relay Off');
gotoxy(39,24); writeln(' END');
delay(5000);
end.

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3. โปรแกรมคอมพิวเตอร์ทำหน้าที่เป็นเครื่องควบคุมอุณหภูมิ

```

Program Heating_Element_Temperature_With_Thermocouple_Sensor;
uses crt;
var    i , DV : integer ;
        AV, T : real ;
const PA      = $0304;
        Pcontrol = $0307;
begin
    clrscr;
    gotoxy (25,2) ; writeln('Heating _Element_Temperature');
    gotoxy (25,3) ; writeln('-----');
    port[Pcontrol]:=$90;
    for i := 1 to 9999 do
    begin
        DV := port[PA];

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gotoxy (31,12); writeln ('Digital Voltage(DV) = ',DV:3);
delay(150);
AV:=(5/255)*DV;
gotoxy (29,16); writeln('Analog Volage(AV) = ',DV:3:3, 'V');
delay(150);
T := (-0.548*AV*AV-28.818*AV+148.84);
gotoxy(25,22); writeln('Measured Temperature(T) = ' T:3:2, 'deg C');
delay(150);
end;
end;

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4. โปรแกรมคอมพิวเตอร์แสดงแรงดันเทอร์โมอิเล็กทริกกับเวลา

```

Program Thermoelectric_Voltage_vs_time_Graph;
uses crt, graph;
var grdrv, grmode, grerror : integer;
    ch                       : char;
    DV                       : byte;
const PA                    = $0304;
    Pcontrol = $0307;
procedure axis;
var p,q : integer;
    tex : string;
begin
    grdrv:=detect ; initgraph (grdrv,grmode,'c:\tp\bgi');
    setgraphmode (grmode);
    line (50,50,50,305) ; line (50,305,600,305);
    line (50,50,600,50) ; line (600,50,600,305);
    settextstyle (defaultfont , horizdir,0);
    for p := 50 to 600 do

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begin
  if p mod 32 = 0 then
    begin
      line (p+18, 295, p+18, 305); str(round(p/32-1),tex);
      outtextxy (p+18, 320, tex);
    end;
  end;
  settextstyle (defaultfont , horizdir,0);
  for q:= 50 to 305 do
    begin
      line(45,q,55,q) ; str(( (305-q) mod 5)+1, tex); outtextxy(20,q,tex)
    end;
  end;
procedure plot ;
var i, j, x, y, DV : integer;
    AV      : real;
begin
  outtextxy (235,10, THERMOELECTRIC VOLTAGE VS TIME GRAPH );
  outtextxy (235,18, ----- );
  outtextxy (50,30, voltage (v));
  outtextxy (540,340,time (s));
  outtextxy (48,303,'*');
  begin
    DV := 0; AV:= 0;
    port [Pcontrol ]:=$90;
    for j:=0 to 550 do
      begin
        DV:=port[PA];
        AV:=(5/255)*DV;

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        x:=j+50 ; y:=305-DV;
        lineto(x,y);
        delay(30)
    end;
end;
readln;
closegraph;
end;
begin (main)
    repeat
        axis;
        plot;
        ch:=readkey;
    until ord(ch) = 27;
end.

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5. โปรแกรมแสดงการหาค่าสนามแม่เหล็กด้วยคอมพิวเตอร์

```

Program Magnetic_Field_Measurement ;
uses crt, dos ;
var i , DV          : integer;
    AV, f, w, r, L, v, B : real;
const PA           = $0304;
    Pcontrol = $0307
begin
    clrscr;
    gotoxy (29,2 ) ; writeln('Magnetic Field Measurement') ;
    gotoxy (29,3 ) ; writeln('-----') ;
    Port[Pcontrol] : =$90;
    L:=263.95; r:=0.021; f:=22;

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```
for i=1 to 5500 do
begin
    DV:=port[PA]
    gotoxy(27,10); writeln('Digital Voltage Input = ',DV:3);
    AV := (5/225)*DV;
    gotoxy (26,12);writeln('Analog Voltage Input = ',AV:3:2, 'V');
    V:=96.33*AV;
    B:=V/(L*2*(22/7)*(f)*r);
    gotoxy (24,22);writeln('Magnetic Field = ', B:3:9, 'Wb/m2');
    delay(100);
end;
end.
```