

ДОДАТОК А
Код програми

\$regfile = "m16def.dat"

\$crystal = 7372800

\$hwstack = 40

\$swstack = 16

\$framesize = 32

ConfigPortc = Output

Ddrd = &B11000110

Portd = &B00111001

ReleAlias Portd.2

Kn1 Alias Pind.3

Kn2 Alias Pind.4

Kn3 Alias Pind.5

A0 Alias Portd.7

A1 Alias Portd.6

ConfigAdc = Single , Prescaler = Auto , Reference = Internal

Config Timer0 = Timer , Prescale = 64

Config Timer2 = Timer , Prescale = 256

On Oc0 Milisek

On Oc2 Sek

Compare0 = 115

Compare2 = 240

DimRegim_dispAsByte	'номер режима отображения
DimRegim_setAsByte	'номер режима настройки
DimNumAsByte	'вспомогательная переменная для таймера
DimNum_sAsByte	'количество секунд
DimNum_mAs Word	'количество минут
DimDnAsByte	'текущий номер знакоместа
DimDgAsByte	'текущий номер знакоместа с точкой
Dim D(4) AsByte	'цифра отображаемая в соответствующем знакоместе
DimTmpAsDword	
Dim U As Word	'RMS напряжение
Dim I As Word	'RMS ток
DimFull_pAs Word	'Полная мощность
DimAct_pAs Word	'Активная мощность
Dim P1 AsByte	'Уставка мощности 1-го уровня
Dim P2 AsByte	'Уставка мощности 2-го уровня
DimTmr_pAs Word	'Таймер уставки мощности (минут)
DimTmr_onAsByte	'Таймер на включение нагрузки после отключения
	'по уставке (минут)
DimPssAsByte	'
DimUiAs Word	'выборкатока

DimUvAs Word	'выборканапряжения
DimCdAs Word	'вспомогательнаяпеременная
DimSiAsDword	'суммавыбороктока
DimSuAsDword	'суммавыборокнапряжения
DimResAsSingle	
DimD_clkAsByte	'переменнаяциклаиндикатора
DimN_clkAsByte	'счетчиквыборок
DimGotovAsBit	'признак готовностисуммквдратоввыборок
DimIs_tmrAsBit	'признак запуска таймера превышения уставки
DimPausaAsBit	'
DimIs_mmAsBit	'

```

DeclareSubDispl_u(c As Word)
DeclareSubDispl_i(c As Word)
DeclareSubDispl_p(c As Word)
DeclareSub Displ_p1(c AsByte)
DeclareSub Displ_p2(c AsByte)
DeclareSubDispl_t(c As Word)
DeclareSubDispl_tb(c AsByte)
DeclareSubDispl_off()

```

```

StartAdc
Start Timer0
EnableInterrupts
Enable Oc0

```

```

Regim_disp = 1
Regim_set = 1
Dg = 0
Num_s = 0
Num_m = 0
Pss = 0
ResetIs_tmr
ResetPausa
ResetIs_mm

```

```

P1 = 10
P2 = 50
Tmr_p = 0
Tmr_on = 1

```

```

ForNum = 1 To 4
  D(4) = 31
  D(3) = 25
  D(2) = 25
  D(1) = 23
Waitms 400

```

```

D(4) = 50
D(3) = 50
D(2) = 50
D(1) = 50
Waitms 300
NextNum

Waitms 500
SetRele
Num = 0

Start Timer2
Enable Oc2

'-- Основной цикл работы программы устройства -----
Do
'-- Опрос кнопок управления -----
If Kn1 = 0 Then
Waitms 200
If Kn1 = 0 Then
Regim_disp = Regim_disp + 1
If Regim_disp > 6 Then Regim_disp = 1
Endif
Endif

If Kn2 = 0 Then
Waitms 200
If Kn2 = 0 Then
Regim_disp = Regim_disp - 1
If Regim_disp < 1 Then Regim_disp = 6
Endif
Endif

If Kn3 = 0 Then
Waitms 200
If Kn3 = 0 Then
Gosub Nastroyka
Endif
Endif
'-----

'-- Расчет напряжения, тока и мощности -----
If Gotov = 1 Then
Su = Su / 458
Res = Su
    U = Sqr(res)
Si = Si / 475

```

```

Res = Si
Res = Sqr(res)
  I = Res
Full_p = U * I
Full_p = Full_p / 1000
Si = 0
Su = 0
N_clk = 0
ResetGotov
EndIf
'-----

'-- Проверкапревышения уставок 1 и 2 -----
IfFull_p>= P1 Then
IfTmr_p = 0 Then
ResetIs_tmr
SetPausa
Dg = 0
  D(4) = 26
  D(3) = 25
  D(2) = 24
  D(1) = 5 - Pss
IfPss>= 5 Then
ResetRele
ResetPausa
Pss = 0
EndIf
Else
SetIs_tmr
IfFull_p>= P2 Then
SetPausa
Dg = 0
  D(4) = 27
  D(3) = 29
  D(2) = 24
  D(1) = 5 - Pss
IfPss>= 5 Then
ResetRele
ResetPausa
ResetIs_tmr
Pss = 0
EndIf
Else
ResetPausa
Pss = 0
EndIf
EndIf

```

```

Else
IfRele = 0 Then
SetIs_mm
IfNum_m>= Tmr_onThen
SetPausa
Dg = 0
    D(4) = 25
    D(3) = 30
    D(2) = 24
    D(1) = 5 - Pss
IfPss>= 5 Then
SetRele
ResetPausa
ResetIs_mm
Pss = 0
Num_m = 0
EndIf
EndIf
Else
IfIs_tmr = 1 ThenResetIs_tmr
ResetPausa
Pss = 0
Num_m = 0
EndIf
EndIf
'-----

'-- Отображениережимовработыустройства на экране -----
IfPausa = 0 AndRele = 1 Then
IfRegim_disp = 1 ThenCallDispl_u(u)
IfRegim_disp = 2 ThenCallDispl_i(i)
IfRegim_disp = 3 ThenCallDispl_p(full_p)
IfRegim_disp = 4 ThenCall Displ_p1(p1)
IfRegim_disp = 5 ThenCall Displ_p2(p2)
IfRegim_disp = 6 ThenCallDispl_t(tmr_p)
ElseifPausa = 0 AndRele = 0 Then
Dg = 0
    D(4) = 25
    D(3) = 28
    D(2) = 28
    D(1) = 50
EndIf
'-----

Waitms 100

Loop

```

Sek:

Num = Num + 1

IfNum = 120 Then

Num = 0

Num_s = Num_s + 1

IfPausa = 1 ThenPss = Pss + 1

Endif

IfNum_s = 60 Then

IfIs_mm = 1 ThenNum_m = Num_m + 1

Num_s = 0

IfIs_tmr = 1 Then

IfTmr_p > 0 Then

Tmr_p = Tmr_p - 1

Else

Tmr_p = 0

Endif

Endif

Endif

Return

Milisek:

Timer0 = 0

'-- измерение, квадратурование и суммирование -----

IfN_clk < 200 Then

Ui = Getadc(0)

Uv = Getadc(1)

IfUi > 511 Then

Ui = Ui - 511

Else

Ui = 511 - Ui

Endif

Tmp = Ui * Ui

Si = Si + Tmp

IfUv > 511 Then

Uv = Uv - 511

Else

Uv = 511 - Uv

Endif

Tmp = Uv * Uv

Su = Su + Tmp

IncrN_clk

Else

SetGotov

EndIf

GosubDispl

Return

'-----

Displ:

'-- индикация -----

IncrD_clk

IfD_clk = 4 Then

D_clk = 0

IncrDn

IfDn = 5 ThenDn = 1

SelectCaseDn

Case 1 : A0 = 0

A1 = 0

Case 2 : A0 = 1

A1 = 0

Case 3 : A0 = 0

A1 = 1

Case 4 : A0 = 1

A1 = 1

EndSelect

SelectCase D(dn)

Case 0 : Portc = &B11111100

Case 1 : Portc = &B01100000

Case 2 : Portc = &B11011010

Case 3 : Portc = &B11110010

Case 4 : Portc = &B01100110

Case 5 : Portc = &B10110110

Case 6 : Portc = &B10111110

Case 7 : Portc = &B11100000

Case 8 : Portc = &B11111110

Case 9 : Portc = &B11110110

Case 20 : Portc = &B01111100

'Обозначениенапряжения-U

Case 21 : Portc = &B11101110

'Обозначениетока-A

Case 22 : Portc = &B11001110

'Обозначениемощности-P

Case 23 : Portc = &B00011110

'Обозначение таймера уставки-t

Case 24 : Portc = &B00000010

'Тире-"-"

Case 25 : Portc = &B00111010

'Буква-"o"

Case 26 : Portc = &B00011100

'Буква-"L"

Case 27 : Portc = &B01101110

'Буква-"H"

Case 28 : Portc = &B10001110

'Буква-"F"

Case 29 : Portc = &B00001100

'Буква-"I"

```
Case 30 : Portc = &B00101010      'Буква-"н"
Case 31 : Portc = &B00111110      'Буква-"б"

Case 50 : Portc = &B00000000      'Выключение дисплея
EndSelect
IfDn = DgThenPortc = Portc + 1
EndIf
Return
'-----
```

```
*****
```

```
SubDispl_u(c As Word)
```

```
Dg = 0
  D(4) = 20
  C = C Mod 1000
Cd = C / 100
  D(3) = Cd
  C = C Mod 100
Cd = C / 10
  D(2) = Cd
  C = C Mod 10
  D(1) = C
EndSub
```

```
SubDispl_i(c As Word)
```

```
Dg = 2
  D(4) = 21
  C = C Mod 1000
Cd = C / 100
  D(3) = Cd
  C = C Mod 100
Cd = C / 10
  D(2) = Cd
  C = C Mod 10
  D(1) = C
EndSub
```

```
SubDispl_p(c As Word)
```

```
Dg = 2
  D(4) = 22
  C = C Mod 1000
Cd = C / 100
  D(3) = Cd
  C = C Mod 100
Cd = C / 10
  D(2) = Cd
```

```
C = C Mod 10
D(1) = C
EndSub
```

```
Sub Displ_p1(c AsByte)
LocalCcAs Word
Dg = 2
D(4) = 22
Cd = C / 100
D(3) = 1
Cc = C Mod 100
Cd = Cc / 10
D(2) = Cd
Cc = CcMod 10
D(1) = Cc
EndSub
```

```
Sub Displ_p2(c AsByte)
LocalCcAs Word
Dg = 2
D(4) = 22
Cd = C / 100
D(3) = 2
Cc = C Mod 100
Cd = Cc / 10
D(2) = Cd
Cc = CcMod 10
D(1) = Cc
EndSub
```

```
SubDispl_t(c As Word)
LocalCcAs Word
Dg = 0
D(4) = 23
Cd = C / 100
D(3) = Cd
Cc = C Mod 100
Cd = Cc / 10
D(2) = Cd
Cc = CcMod 10
D(1) = Cc
EndSub
```

```
SubDispl_tb(c AsByte)
LocalCcAsByte
Dg = 0
D(4) = 23
```

```
D(3) = 31
Cc = C Mod 100
Cd = Cc / 10
D(2) = Cd
Cc = Cc Mod 10
D(1) = Cc
EndSub
```

```
SubDispl_off()
Dg = 0
D(4) = 50
D(3) = 50
D(2) = 50
D(1) = 50
EndSub
```

```
'#### Подпрограмма настройки режимов работы #####
```

```
Nastroyka:
```

```
Regim_set = 1
```

```
Do
```

```
If Kn1 = 0 And Kn3 = 1 Then
```

```
Waitms 200
```

```
If Kn1 = 0 And Kn3 = 1 Then
```

```
Regim_set = Regim_set + 1
```

```
If Regim_set > 4 Then Regim_set = 1
```

```
Endif
```

```
Endif
```

```
If Kn2 = 0 And Kn3 = 1 Then
```

```
Waitms 200
```

```
If Kn2 = 0 And Kn3 = 1 Then
```

```
Regim_set = Regim_set - 1
```

```
If Regim_set < 1 Then Regim_set = 4
```

```
Endif
```

```
Endif
```

```
If Regim_set = 1 Then
```

```
If Kn1 = 0 And Kn3 = 0 Then
```

```
Waitms 200
```

```
If P1 < 10 Then P1 = P1 + 1
```

```
Endif
```

```
If Kn2 = 0 And Kn3 = 0 Then
```

```
Waitms 200
```

```
If P1 > 0 Then P1 = P1 - 1
```

```
Endif
```

Call Displ_p1(p1)

Waitms 200

CallDispl_off()

Waitms 200

Endif

IfRegim_set = 2 Then

If Kn1 = 0 And Kn3 = 0 Then

'Waitms 200

If P2 < 50 Then P2 = P2 + 1

Endif

If Kn2 = 0 And Kn3 = 0 Then

'Waitms 200

If P2 > 10 Then P2 = P2 - 1

Endif

Call Displ_p2(p2)

Waitms 200

CallDispl_off()

Waitms 200

Endif

IfRegim_set = 3 Then

If Kn1 = 0 And Kn3 = 0 Then

'Waitms 200

IfTmr_p < 60 ThenTmr_p = Tmr_p + 1

Endif

If Kn2 = 0 And Kn3 = 0 Then

'Waitms 200

IfTmr_p > 0 ThenTmr_p = Tmr_p - 1

Endif

CallDispl_t(tmr_p)

Waitms 200

CallDispl_off()

Waitms 200

Endif

IfRegim_set = 4 Then

If Kn1 = 0 And Kn3 = 0 Then

'Waitms 200

IfTmr_on < 60 ThenTmr_on = Tmr_on + 1

Endif

If Kn2 = 0 And Kn3 = 0 Then

'Waitms 200

IfTmr_on > 0 ThenTmr_on = Tmr_on - 1

Endif

CallDispl_tb(tmr_on)

Waitms 200

CallDispl_off()

Waitms 200

Endif

If Kn1 = 0 And Kn2 = 0 And Kn3 = 1 Then

Waitms 500

If Kn1 = 0 And Kn2 = 0 And Kn3 = 1 ThenExitDo

Endif

Loop

Return

ДОДАТОК Б

Графічний матеріал атестаційної роботи

