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Improvement Test

Sub: Basic Electronics Code: 15ELN25

Date: 29/05/2017 Duration: 90 mins Max Marks: 50 Sem: II Sections:- A,B,C, D, E, F and G

Answer any FIVE FULL questions.

		Marks	OBE RBT	
1.	Explain the architecture of 8051 microcontroller with neat diagram.	[10]	CO4	L2
2.	Derive AM wave expression with relevant waveforms. Also, draw frequency spectrum and calculate the bandwidth of AM signal.	[10]	CO5	L2
3.	Derive the total power transmitted by an AM wave. A 1000 W, 1 MHz carrier is amplitude modulated with a sinusoidal signal of 1 KHz. The depth of modulation is 50%. Calculate the bandwidth, power in the sidebands and the total transmitted power.	[5+5]	CO5	L2
4.	Explain the working of Thermistor and LVDT along with suitable diagram.	[5+5]	CO6	L2

5. List the differences between AM and FM signals. [10] CO5 L2

6. Write a short note on i) AM demodulator ii) Working of stepper motor. [5+5] CO5 L2

7. Explain the structure of PSW and internal RAM of 8051. [5+5] CO4 L2

Basic Electronics — Evaluation-Scheme-IAT-3

29 May, 2017 — Section- A, B, C, D, E, F and G

Ans-1 Architecture diagram – 4 marks
Explanation — 6 marks.

Ans-2 AM wave derivation — 4 marks
Waveform — 2 marks
Frequency spectrum — 2 Marks
Bandwidth — 2 Marks.

Ans-3 Derivation Total Power = 5 marks

- Bandwidth = 1 Mark
- P_{USB} = 1 Mark
- P_{LSB} = 1 Mark
- P_T = 2 Mark

Ans-4 Thermistor Explanation – 4 Mark, diagram – 1 Mark } (5)

LVDT Explanation – 4 Mark, diagram – 1 Mark } (5)

Ans-5 5 Difference — 10 Marks

Ans-6 Diagram AM – 1, Explanation-4 } (5) Stepper Motor dia – (1), Working — (4)

Ans-7 PSW → 5 Marks, RAM → 5 Marks

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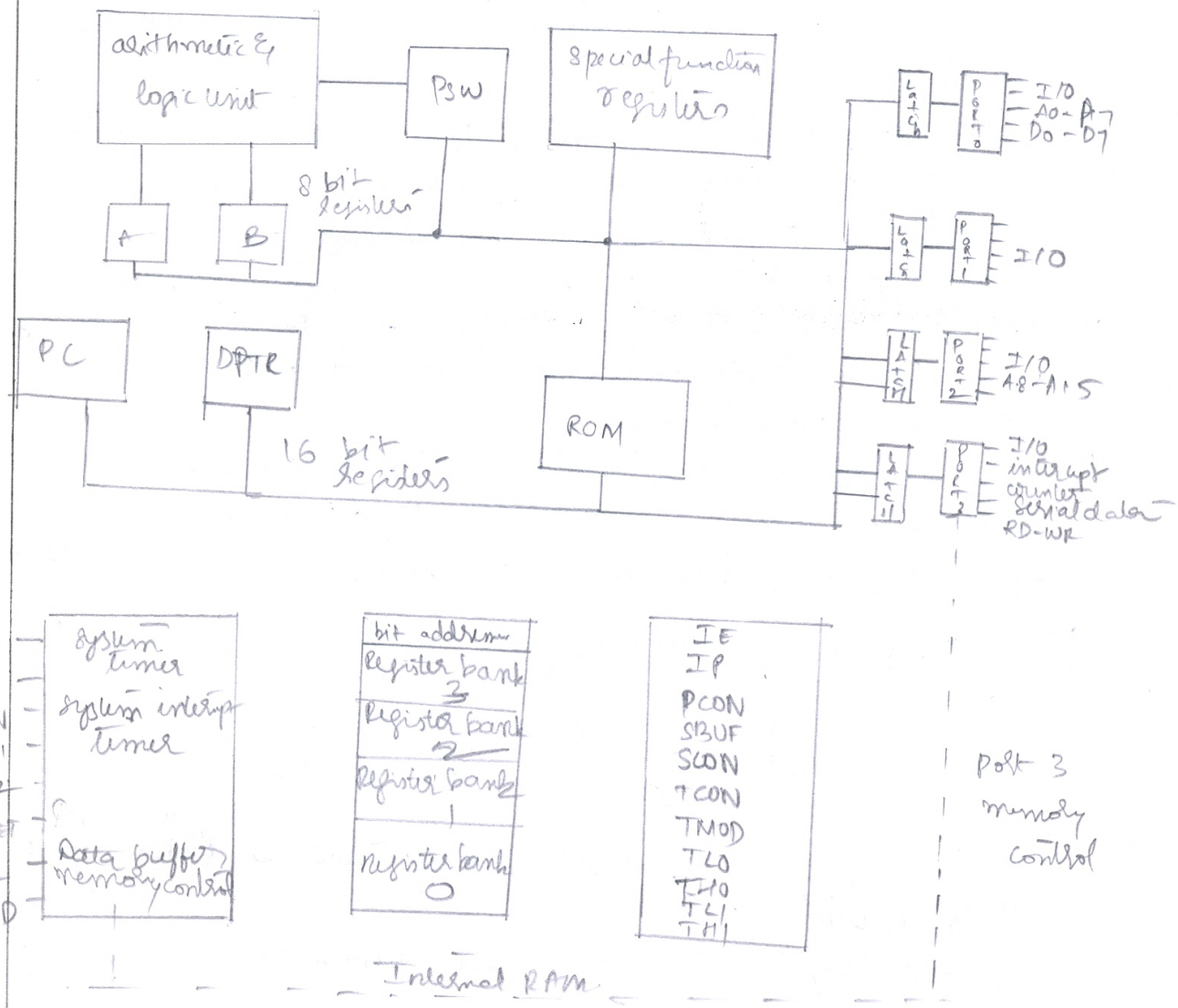
IAT-3

1)


arithmetic & logic unit
PSW
special function registers
8 bit registers
A
B
PC
DPTR
16 bit registers
ROM
LATCH
PORT 0
I/O
A0 - A7
D0 - D7
LATCH
PORT 1
I/O
LATCH
PORT 2
I/O
A8 - A15
LATCH
PORT 3
I/O
interrupt
counter
serial data
RD-WR
system timer
system interrupt timer
Data buffer memory control
bit address
Register bank 3
Register bank 2
Register bank 1
register bank 0
IE
IP
PCON
SBUF
SCON
TCON
TMOD
TL0
TH0
TL1
TH1
port 3
memory control
Internal RAM

Register A :- It is an 8 bit register. It is also called as an accumulator. It holds the source operand & receives the result of arithmetic operation like addition, subtraction, division & multiplication.

Register B :- It is an 8 bit register & an accumulator. It is used for the operation of division & multiplication.

Data pointer :- It is an 16 bit register. It has a capacity to hold 16 bits. It can hold low byte as well as high byte addresses. It acts as a base register for indirect jumps, look up table & external data transfer.

Program counter :- It is also an 16 bit register. It is used to hold the address of external memory location from which the information is fetched.

PSW :- It is also called as flag register.

CY	AC	F0	RS1	RS0	OV	-	P
B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0

CY → carry flag :- It is set when there is over flow out of 7 bit.

AC → Auxillary flag :- It is set when there is over flow out of 3 bit.

F0 → It is defined by user for general purpose.

RS1 & RS0

RS1	RS0	Bank selected	
0	0	Bank 0	00H - 07H
0	1	Bank 1	08H - 0FH
1	0	Bank 2	10H - 17H
1	1	Bank 3	18H - 1FH.

OV → overflow flag :- It is set when the signed number operation is large, carry into high bit goes into sign bit.

P → Parity flag :- It is determined by the number of one present in the accumulator. If P=1 then the number of ones present in the accumulator is odd. If P=0 then the number of ones present in the accumulator are even.

Ports :-

Port 0 :- Pins of port 0 can be used as I/O. Output drives & input buffers can be used to access the external memory data. Port 0 outputs low byte of external memory address.

Port 1 :- It is used as I/O.

Port 2 :- The pins of port 2 can be used to access the external memory data. Outputs high byte of external memory address.

Port 3 :- The pins of port-3 are multifunctional. It can be used for I/O or for some other alternate function.

Vcc & Vss :- +5V is connected to Vcc & grounded to Vss pin.

Crystal oscillator pins : XTAL1, XTAL2 :- 8051 has an in built oscillator in order to generate internal clock signal.

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(3) (a) $P_T = P_C + P_{USB} + P_{LSB}$

$$P_T = \frac{V_c^2}{R} + \frac{V_{USB}^2}{R} + \frac{V_{LSB}^2}{R}$$

$$P_T = \left(\frac{V_c}{\sqrt{2}}\right)^2 \frac{1}{R} + \left(\frac{\frac{mV_c}{2}}{\sqrt{2}}\right)^2 \frac{1}{R} + \left(\frac{\frac{mV_c}{2}}{\sqrt{2}}\right)^2 \frac{1}{R}$$

$$= \frac{V_c^2}{2R} + \frac{m^2 V_c^2}{8R} + \frac{m^2 V_c^2}{8R}$$

$$P_T = \frac{V_c^2}{2R} + \frac{m^2 V_c^2}{4R}$$

$$= \frac{V_c^2}{2R}\left[1 + \frac{m^2}{2}\right]$$

$$= P_c\left[1 + \frac{m^2}{2}\right]$$

(b) $P_c = 1000W$, $f_c = 1MHz$, $f_m = 1KHz$

$m = 0.5$, $B.W = ?$, $P_{USB}, P_{LSB} = ?$, $P_T = ?$

(c) $P_{LSB} = 62.5W$

$P = P_{LSB} + P_{USB} = 125W$.

(d) $P_t = P_c\left(1 + \frac{m^2}{2}\right)$

$= 1000\left[1 + \frac{(0.5)^2}{2}\right] = 1125W$.

4) a Thermister :-

~~(i) To determine the ch~~

(1) Temperature changes in terms of resistance.

(2) The resistive element is made up of solid particles.

(3) The resitivity for the conductor ~~of semi~~ increases with ↑ in temp where as for semiconductor & insulator ρ ↓ as Temp ↑.

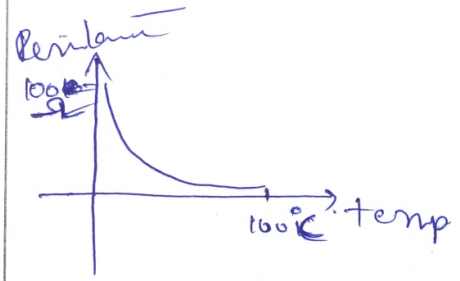
working principle :- It is used to determine the resistance change in order to determine temp changes.

$R = R_0(1 + \alpha\Delta T)$ where $R \rightarrow$ Resistance at $t°C$

$R_0 \rightarrow$ " " $0°C$

$\alpha \rightarrow$ temp co-efficient.

$\Delta t \rightarrow$ change in temp.



They are available in various shapes & sizes. Thermistors are made up of sintered mixture of metallic oxides like manganese nickel, iron etc.

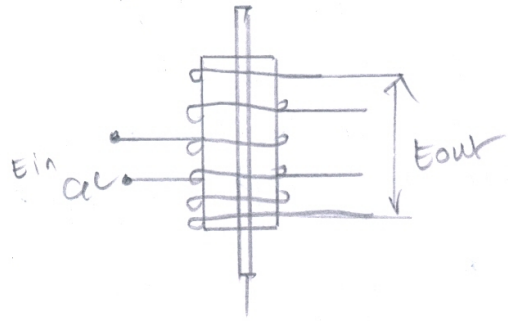
Beads:-  These are small with a diameter of 0.15mm & 1.25mm.

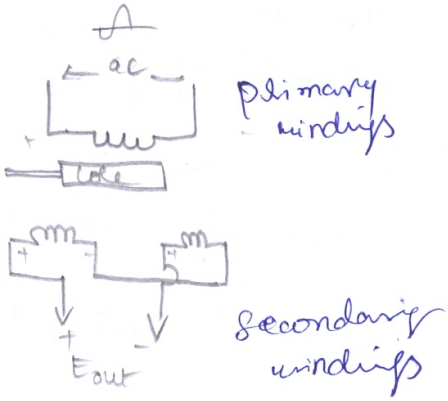
Probes:-  Beads are sealed in the tip of the solid glass rod to form probes.

disc:- ~~lead~~ rod 

disc & rods are made by pressing the thermistor at a very high pressure. Washers are connected in series & parallel for proper power dissipation.

LVDT: (Linear variable displacement transducer)



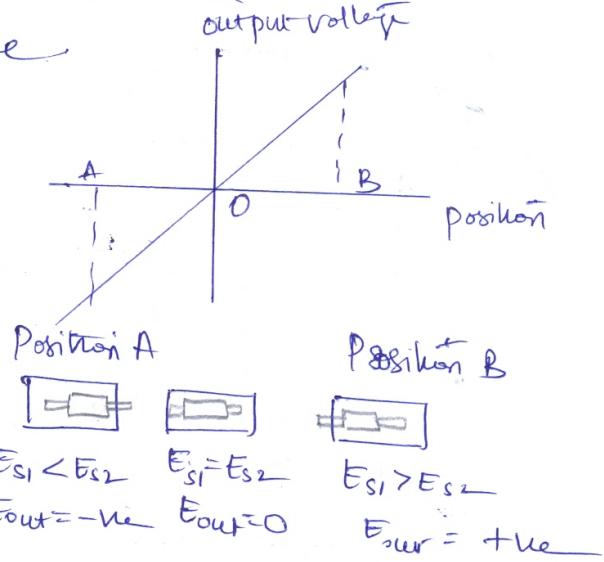


case(i)

When an ac source is applied to primary windings with the core at the centre, the emf induced by the secondaries will become equal. $E_{S1} = E_{S2}$. Since they oppose each other the out put voltage will become equal to zero.

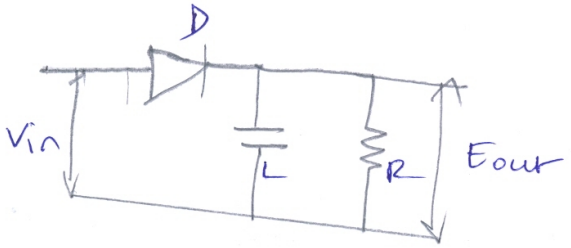
Case(ii): when the core is moved towards the right side, flux links more on right hand coil than on left hand. $E_{s1} < E_{s2}$. Output voltage is will be equal to negative

Case(iii) when the core is moved towards the left side, flux links more on left hand coil than on right hand. $E_{s1} > E_{s2}$. Output voltage will be equal to true



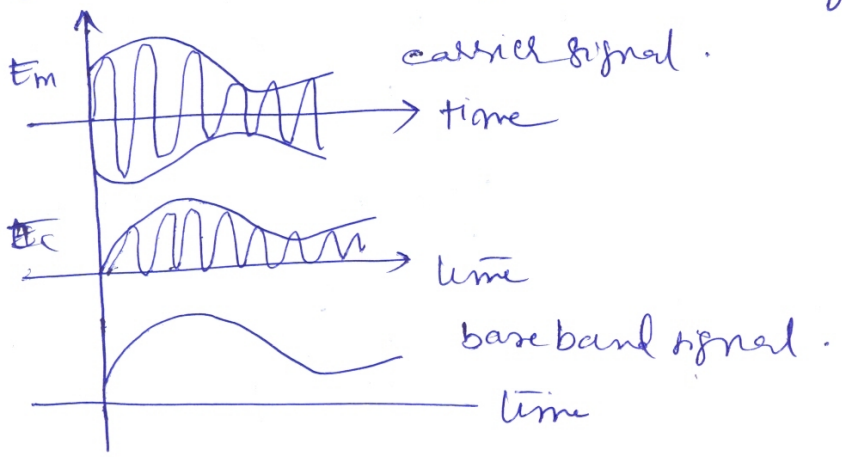
6(a) AM demodulator:

It is ~~used to~~ the part of the receiver which is used to restore the original signal or information

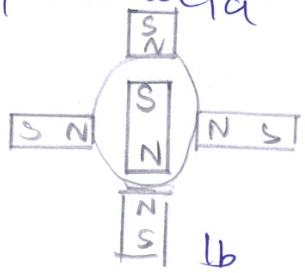


In this fig D acts as half wave rectifier diode & LR acts as a low pass filter.

During the +ve half cycle the AM signal diode conducts, the current flows through R. During the -ve half cycle the AM signal diode does not conduct as the result current doesn't flow through R. Capacitor is connected in parallel with resistance. Capacitor provides low ~~impedance~~ impedance for the carrier signal & high impedance for modulating signal. Thus capacitor filters the carrier signal & leaves the original modulating signal.



(ii) Stepper motor



When electrical signals are applied to the motor, the motor starts rotating at the speed at which the electrical signals are applied. The direction of rotation depends on the pattern of the

is called shaft which is surrounded by ~~shaft~~ stator. There are 4 stator windings which are paired with centre tapped common.

Working principle :- The centre tap on stator windings produces the current in the coil which changes when the stepper windings are grounded. The magnetic property of stator changes & respectively attracts the repels the motor this results in stepper motion of the motor.

Single coil excitation

1a	2a	1b	2b	Position of motor
1	0	0	0	S N
0	1	0	0	N S
0	0	1	0	N S
0	0	0	1	S N
↑	0	0	0	S N

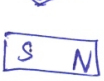
It completes its 1 revolution in 4 steps. Each steps are at angle of 90°.

Full step size excitation

1a	2a	1b	2b	Position of motor
1	1	0	0	N S
0	1	1	0	N S
0	0	1	1	S N
↑	0	0	1	S N
1	1	0	0	N S

It completes its 1 revolution in 4 steps. Each steps are at angle of 90°

Half step size excitation

	1a	2a	1b	2b	Position of rotor
1	1	0	0	0	
2	1	1	0	0	
3	0	1	0	0	
4	0	1	1	0	
5	0	0	1	0	
6	0	0	1	1	
7	0	0	0	1	
8	1	0	0	1	
9	1	0	0	0	

(6) To complete 1 revolution it takes 8 steps. Each step is at the angle of 45°.

(7) PSW :- It is also called as flag register -

B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0
CY	AC	F0	RS1	RS0	OV	-	P

CY → carry flag :-

It is set when there is over flow of 7 bit. It can also be used as borrow flag for subtraction.

AC → Auxillary flag :-

It is set when there is over flow of 3 bit ie carry from lower nibble to higher nibble

F0 → It is defined by user for general purpose.

RS1 & RS0

RS1	RS0	Bank selection	
0	0	Bank 0	00H - 07H
0	1	Bank 1	08H - 0FH
1	0	Bank 2	10H - 17H
1	1	Bank 3	18H - 1FH

OV → over flow flag :-

It is set when the signed number operation is large, & when high bit goes into sign bit.

P → Parity flag :-

It is determined by the number of ones which are present in the accumulator. If P=1, the number of ones which are present in accumulator are odd & if P=0, the number of ones which are present in the accumulator are even.

(b) Internal RAM of 8051

It consists of 3 types

(a) Register banks,

(b) Bit/Byte addresses

(c) General purpose

(a) Register banks :- From first 32 bytes of 00H to 1FH of internal RAM constitute 32 registers.

RS1	RS0	Bank selection
0	0	Bank 0
0	1	Bank 1
1	0	Bank 2
1	1	Bank 3

(OR)

RS1	RS0	Bank selection
0	0	Bank 3
0	1	Bank 2
1	0	Bank 1
1	1	Bank 0

(b) Bit / Byte addressy :- 8051 provides 16 bytes of addresses. It occupies ~~internal~~ RAM bytes of addresses 20H to 2FH.

(c) General purpose :- RAM area is above the bit addressa area whose address is of 30H to 7FH.

(1) ALE :- A_0 to A_7 are multiplexed. In order to de multiplex these lines internal clock signal is used.

RESET :- It is used to reset the entire microcontroller. The reset signal must be atleast of height ~~of~~ & two clock cycle machines.

PSEN :- It is the active low output signal which is used to activate the enable signal of external ROM.

EA :- EA is high when program fetches to addresses from 0000H to 0FFFH to direct it to ~~external~~ internal ROM & fetches to addresses from 1000H to FFFH to direct it to external ROM. If EA is low the program fetches to address from 0000H to FFFH to direct it to external ROM