Embedded Systems Interview Questions And Answers Guide.

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Embedded Systems Job Interview Preparation Guide.

Question # 1

Write a code in C / Verilog to implement a basic FIR filter?

Answer:-

```
%program for FIR filters
disp('choose the window from the list');
ch=menu('types of
windows','bartlett','blackman','hamming','hanning','kaiser',
'rectangular');
rp=input('enter the passband ripple in db');
rs=input('enter the stopband ripple in db');
wsample=input('enter sampling frequency in hertz');
wp=input('enter the passband frequency in hertz');
ws=input('enter the stopband frequency in hertz');
wp=2*wp/wsample; ws=2*ws/wsample;
p=20*log10(sqrt(rp*rs))-13;
q=14.6*(ws-wp)/wsample;
N=1+floor(p/q);
N1=N;
if(rem(N,2)==0)
   N1=N+1;
else
   N=N-1;
end
   switch ch
case 1
   y=bartlett(N1);
case 2
   y=blackman(N1);
case 3
   y=hamming(N1);
case 4
   y=hanning(N1);
case 5
   beta=input('enter beta for kaiser window');
   y=kaiser(N1,beta);
case 6
   y=boxcar(N1);
otherwise
   disp('enter proper window number');
end
disp('select the type of filter from the list');
type=menu('types of
filters','lowpass','highpass','bandpass','bandstop');
switch type
case 1
   b=fir1(N,wp,'low',y);
case 2
   b=fir1(N,wp,'high',y);
case 3
   b=fir1(N,[wp ws],'bandpass',y);
case 4
   b=fir1(N,[wp ws],'stop',y);
otherwise
   disp('enter type number properly');
end
[h,w]=freqz(b,1,512);
magn=20*log10(abs(h));
phase=(180/pi)*unwrap(angle(h));
w=(w*wsample)/(2*pi);
```

subplot(2,1,1); plot(w,magn),grid on;title('magnitude
plot'); subplot(2,1,2); plot(w,phase),grid on;title('phase
plot');

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Question # 2

How to implement a fourth order Butterworth LP filter at 1kHz if sampling frequency is 8 kHz?

Answer:-

A fourth order Butterworth filter can be made as cascade of
two seond order LP filters with zeta of 0.924 and 0.383.
One can use a bilinear transformation approach for
realising second order LP filters. Using this technique
described well in many texts, one can make two second order
LP filters and cascade them.

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Question # 3

Explain what is plc system?

Answer:-

programming logical control system

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Question # 4

Can we use semaphore or mutex or spin lock in interrupt context in linux kernel?

Answer:-

We cannot sleep in interrupt context so semaphores and mutex
can't be used.
Spinlocks can be used for locking in interrupt context.

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Question # 5

While writing interrupt handlers (ISR), which are points needed to be considered?

Answer:-

Avoid sleep , use GFP_ATOMIC instead of GFP_KERNEL in kmalloc

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Question # 6

Explain can microcontroller work independently?

Answer:-

Obviously, it can work independantly. But to see the output
we need certain output devices like LED, Buzzer can be
connected to check its functionality. Without the help of
any o/p device connected we can check the functionality of
Microcontroller.

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Question # 7

What type of registers contains an (INTEL) CPU?

Answer:-

Special function registers like accumulator,Program
controller(PC),data pointer(DPTR),TMOD and TCON (timing
registers),3 register banks with r0 to r7,Bit addressable
registers like B.

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Question # 8

DMA deals with which address (physical/virtual addresses)?

Answer:-

DMA deals with Physical addresses.
Only when CPU accesses addresses it refers to MMU(Memory
Management Unit) and MMU converts the Physical address to
Virtual address.
But, DMA controller is a device which directly drives the
data and address bus during data transfer. So, it is purely
Physical address. (It never needs to go through MMU &
Virtual addresses).

That is why when writing the device drivers, the physical address of the data buffer has to be assigned to the DMA.

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Question # 9

What is the difference between fifo and the memory?

Answer:-

Fifo(First In Last Out) is a memory sturcture where datas can be stored and retrived (in the order of its entery only). This is a queue,wheras Memory is a storage device which can hold datas dynamically or at any desired locations and can be retrived in any order.

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Question # 10

What is an anti aliasing filter? Why is it required?

Answer:-

Anti aliasing filter reduces errors due to aliasing. If a signal is sampled at 8 kS/S, the max frequency of the input should be 4 kHz. Otherwise, aliasing errors will result. Typically a 3.4kHz will have an image of 4.6 khz, and one uses a sharp cut off filter with gain of about 1 at 3.4kHz and gain of about 0.01 at 4.6 kHz to effectively guard against aliasing. Thus one does not quite choose max frequency as simply fs/2 where fs is sampling frequency. One has to have a guard band of about 10% of this fmax, and chooses max signal frequency as 0.9*fs/2

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Question # 11

What is dirac delta function and its fourier transform and its importance?

Answer:-

Dirac delta is a continuous time function with unit area and infinite amplitude at t=0.
the fourier transform of dirac delta is 1.
using dirac delta as an input to the system, we can get the system respnose. it is used to study the behavior of the circuit.
we can use this system behavior to find the output for any input.

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Question # 12

Suppose i am using I2C communication, in that first i am sending address of thesalve and then data then after i want to read the data which i was sent recently, in that case before i am reading is there any need to send a stop bit before read?

Answer:-

Before reading the data if you are giving the stop bit then the communication is stopped.so after sending the data you will give the stop bit.

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Question # 13

IS 8085 an embedded system?

Answer:-

its not a embedded system...bcoz it will be a part of a embedded system and it does not work on any software..

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Question # 14

Is it necessary to start the execution of a program from the main() in C?

Answer:-

"Normally you are at liberty to give functions whatever names you like, but ``main" is special - your program begins executing at the beginning of main. This means that every program must have a main somewhere." Kernighan & Ritchie - The C Programming Language 2ed. p.6

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Question # 15

What is the role of segment register?

Answer:-

In the x86 processor architecture, memory addresses are specified in two parts called the segment and the offset. One usually thinks of the segment as specifying the beginning of a block of memory allocated by the system and the offset as an index into it. Segment values are stored in the segment registers. There are four or more segment registers: CS contains the segment of the current instruction (IP is the offset), SS contains the stack segment (SP is the offset), DS is the segment used by default for most data operations, ES (and, in more recent processors, FS and GS) is an extra segment register. Most memory operations accept a segment override prefix that allows use of a segment register other than the default one.

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Question # 16

What is difference between micro processor & micro controller?

Answer:-

> Microprocessor is a manager of the resources(I/O, Memory) which lie out-side of its architecture.
> Micro-controllers have I/O, Memory etc. built into it and specially designed for Control applications

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Question # 17

What is Page Fault or Page thrashing?

Answer:-

Some operating systems (such as UNIX or Windows in enhanced mode) use virtual memory. Virtual memory is a technique for making a machine behave as if it had more memory than it really has, by using disk space to simulate RAM (random-access memory). In the 80386 and higher Intel CPU chips, and in most other modern microprocessors (such as the Motorola 68030, Sparc, and Power PC), exists a piece of hardware called the Memory Management Unit, or MMU. The MMU treats memory as if it were composed of a series of â€œpages.â€• A page of memory is a block of contiguous bytes of a certain size, usually 4096 or 8192 bytes. The operating system sets up and maintains a table for each running program called the Process Memory Map, or PMM. This is a table of all the pages of memory that program can access and where each is really located. Every time your program accesses any portion of memory, the address (called a â€œvirtual addressâ€•) is processed by the MMU. The MMU looks in the PMM to find out where the memory is really located (called the â€œphysical addressâ€•). The physical address can be any location in memory or on disk that the operating system has assigned for it. If the location the program wants to access is on disk, the page containing it must be read from disk into memory, and the PMM must be updated to reflect this action (this is called a â€œpage faultâ€•).

Because accessing the disk is so much slower than accessing RAM, the operating system tries to keep as much of the virtual memory as possible in RAM. If you're running a large enough program (or several small programs at once), there might not be enough RAM to hold all the memory used by the programs, so some of it must be moved out of RAM and onto disk (this action is called â€œpaging outâ€•).
The operating system tries to guess which areas of memory aren't likely to be used for a while (usually based on how the memory has been used in the past). If it guesses wrong, or if your programs are accessing lots of memory in lots of places, many page faults will occur in order to read in the pages that were paged out. Because all of RAM is being used, for each page read in to be accessed, another page must be paged out. This can lead to more page faults, because now a different page of memory has been moved to disk.
The problem of many page faults occurring in a short time, called â€œpage thrashing,â€• can drastically cut the performance of a system. Programs that frequently access many widely separated locations in memory are more likely to cause page thrashing on a system. So is running many small programs that all continue to run even when you are

not actively using them. To reduce page thrashing, you can run fewer programs simultaneously. Or you can try changing the way a large program works to maximize the capability of the operating system to guess which pages won't be needed. You can achieve this effect by caching values or changing lookup algorithms in large data structures, or sometimes by changing to a memory allocation library which provides an implementation of malloc() that allocates memory more efficiently. Finally, you might consider adding more RAM to the system to reduce the need to page out.
Page thrashing causes performance degradation. You can increase the ram disk size to reduce page thrashing.

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Question # 18

WHAT IS THE DIFFERENCE BETWEEN TESTING AND VERIFICATION OF VLSI CIRCUIT?

Answer:-

Verification is a front end process and testing is a post silicon process.
verification is to verify the functionality of the design during the design cycle.
Testing is find manufacturing faults.

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