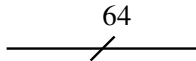


# Solutions to 2003 November ELE12EDP Exam's Electronic Design questions.

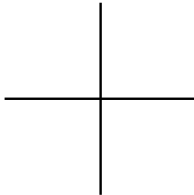
24th October 2004

## Question 3. (Electronic Wiring)

1. Draw a **single line** representation of a **sixty-four** (64) bit data bus.

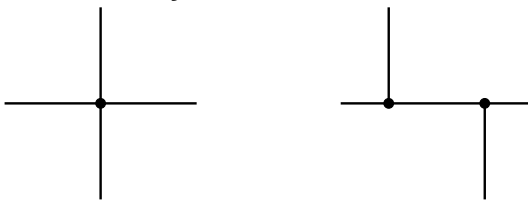


2. Sketch a **crossover**.



3. Why should a **four-way junction** be drawn as *two* **three-way junctions**?

**To clearly distinguish the junction(s) from a crossover. (A junction is an electric connection, a crossover is not.) On the left is a poorly drawn 4-way junction followed by two 3-way junctions representing the same thought more clearly:**

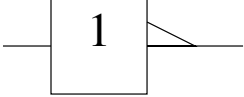


4. In the international standard,
  - (a) what **letter** represents an **analog** device?  
**N.**
  - (b) what letter is used for an **digital** device?  
**D.**

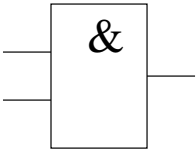
# Question 4. (Logic Symbols)

Draw the IEEE standard symbol for:

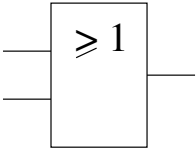
- 1. An **inverter**.



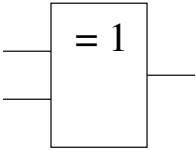
- 2. A 2-input **AND** gate.



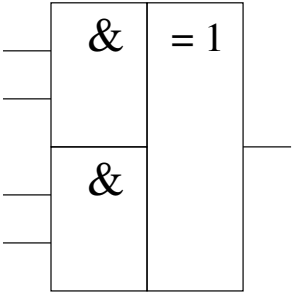
- 3. A 2-input **OR** gate.



- 4. An **XOR** gate.



- 5. A **single** device that functions as *two* 2-input AND gates in *parallel* followed by *one* XOR gate.



## Question 5. (Interconnection of Circuits)

1. Compare **breadboards** with **PCBs** for:

(a) cost;

**Breadboards are less expensive: don't need specialised equipment or resources to build a circuit on a breadboard.**

(b) reliability;

**PCBs are more reliable: no loose wires to fall out unseen (but you do need to examine a PCB carefully to be sure that tracks and solder joints are sound).**

(c) prototyping turnaround time.

**Breadboards are quicker and easier to modify: even major changes to the design can be implemented on the spot, if sensible color coding is used.**

2. Sketch a **thru-hole** connection on a **two-layer** PCB. Make sure to draw and label all features, including:

(a) the board,

(b) the component,

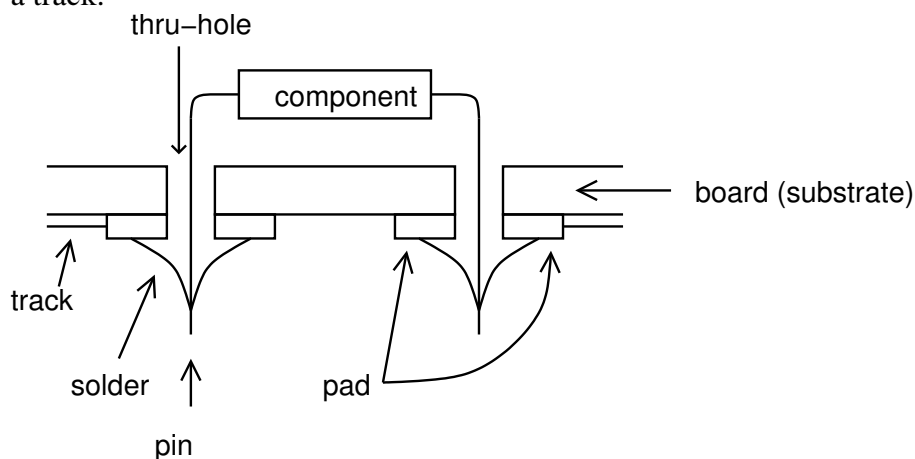
(c) the thru-hole,

(d) a pin/leg,

(e) a pad,

(f) solder, and

(g) a track.



## Question 6. (Computer Aided Design of Circuits)

1. List **two (2)** advantages of **CAD** over manual drawing when producing a schematic.  
**Here's a list of CAD advantages, but perhaps you can think of others: Neater; easier to modify; automatic electrical rule check, netlist, bill of materials; already in electronic form, so cheap and easy to produce many exact copies and to distribute them to colleagues.**
2. Give **two (2)** advantages of using **pencil and paper**, instead of CAD.  
**Don't need a computer, a possibly expensive CAD program, or even electric power, to create, view or edit the schematic; quicker to draw new devices.**
3. In the Fire Alarm project, it was recommended that you use an **open collector inverter** to drive the Zone 1 LED. In Protel schematic, what were (or would be) that inverter's:
  - (a) Library Reference (this is the name of a hex open collector inverter device in the chosen library)  
**74LS05**
  - (b) Designator (the name you give this open collector component on the schematic)  
**OCNOT1A**
  - (c) Footprint (describes the shape of the device in Protel PCB Layout)  
**DIP-14**
  - (d) Part Type (what you would ask for when you place an order from an electronics supplier)  
**74LS05**