

Problem set 5 Issued 26 October, due (that is, solutions available) 16 November

1) Physical logic gates take a finite time to respond to changes in their input signals. What name is given to this time?

- a) Hold time.
- b) Rise time.
- c) Set-up time.
- d) Propagation delay time.

2) Express the binary number 1001 in decimal.

- a) 9
- b) 11
- c) 13
- d) 15

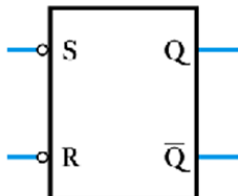
3) Express the decimal number 57 in binary.

- a) 111010
- b) 111001
- c) 110011
- d) 111101

4) Which of the following is not a form of multivibrator?

- a) Astable
- b) Bistable
- c) Tristable
- d) Monostable

5) The S-R latch shown here has active high inputs.



- a) True
- b) False

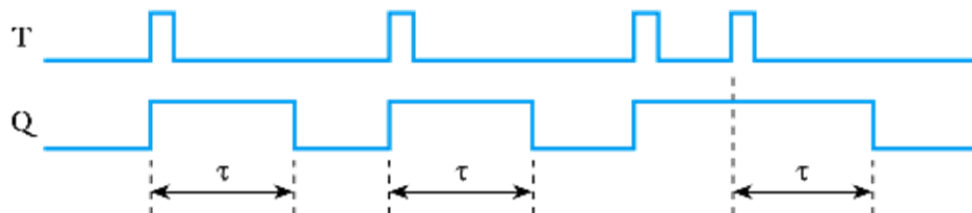
6) A J-K flip-flop has two control inputs. What happens to the Q output on the active edge of the clock if both control inputs are asserted at this time.

- a) The Q output remains unchanged.
- b) The Q output is set to 1.
- c) The Q output toggles to the other state.
- d) The Q output is reset to 0.

7) A master/slave bistable is formed using two bistable connected in series.

- a) True
- b) False

8) What type of monostable produces waveform of the form shown here?

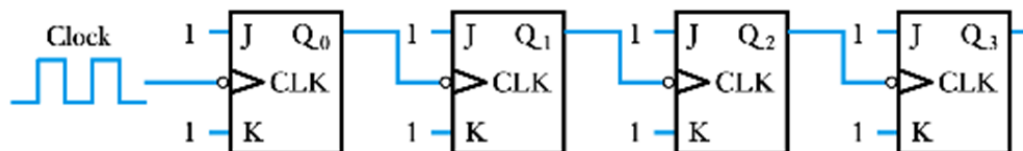


- a) A retriggerable monostable
- b) A non-retriggerable monostable

9) An astable has two metastable states and produces the function of a digital oscillator.

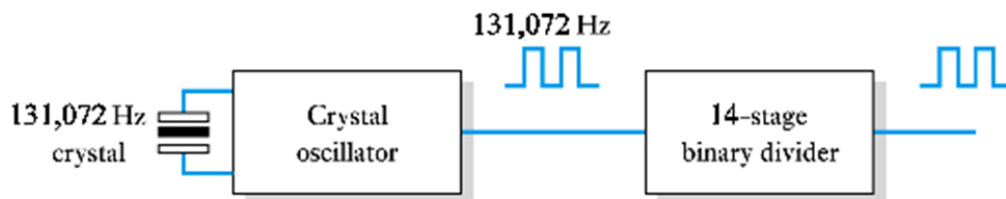
- a) True
- b) False

10) What is the function of the following circuit?



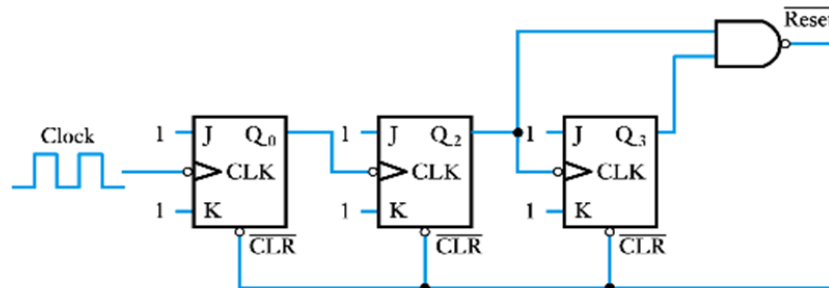
- a) A four-bit shift register.
- b) A four-bit memory register
- c) A four-bit ripple counter.

11) What is the frequency of the output of the following circuit?



- a) 1 Hz
- b) 4 Hz
- c) 8 Hz
- d) 16 Hz

12) What is the function of the following circuit?



- a) A modulo-6 counter.
- b) A modulo-8 counter.
- c) A modulo-10 counter.
- d) A modulo-12 counter.

13) In synchronous counters the clock input of each of the bistables are connected together so that each changes state at the same time.

- a) True
- b) False

14) What is the cause of storage time in a bipolar transistor?

- a) The 'memory effect' of the device.
- b) The inertia of the majority charge carriers.
- c) The time taken to remove excess charge stored in the base region as a result of saturation.
- d) The inertia of the minority charge carriers.

15) What is meant by the fan-out of a logic gate?

- a) The number of other gates that can be connected to the gate's output.
- b) The physical distance between the output pins on the device.
- c) The number of other gates that can be connected to one of the gate's inputs.
- d) The amount of cooling required by the gate.

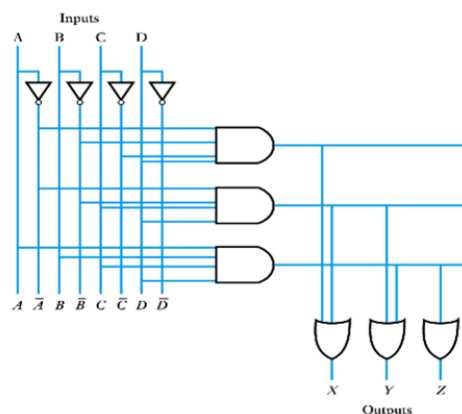
16) Which of the following statements is incorrect?

- a) TTL devices have logic levels of about 3.4 V and 0.2 V.
- b) TTL logic has very low power consumption and is therefore widely used in highly integrated components.
- c) TTL logic normally operates from a single 5 V supply.
- d) Standard TTL devices have a propagation delay that is dominated by the storage time of the bipolar transistors used.

17) What should be done with an unused TTL input that is required to be at logical 1?

- a) It should be connected directly to the positive supply rail.
- b) It should be connected directly to the zero volt supply rail.
- c) It should be left disconnected.
- d) It should be tied to the positive supply rail through an appropriate resistor.

18) In the following PLA, which output implements the logic function ABCD?



- a) X
- b) Y
- c) Z

19) The cells in a FPGA may contain registers, look-up tables and memory.

- a) True b) False

20) Which of the following statements is incorrect?

- a) Some PLDs are programmed using electrically operated switches.
- b) Some PLDs are programmed using mechanical switches.
- c) Some PLDs are programmed using anti-fuses that are selectively joined.
- d) Some PLDs are programmed using fuses that are selectively blown.

21) Communications within a microprocessor take place over a number of serial buses.

- a) True b) False

22) Which of the following statements is incorrect?

- a) Static RAM stores information by energizing or de-energising inductors.
- b) RAM is volatile.
- c) RAM is memory that can be written and read quickly.
- d) Dynamic RAM stores information by charging or discharging capacitors.

23) Which of the following statements is incorrect?

- a) EPROMs can be erased using an ultraviolet light source.
- b) ROM devices are non-volatile.
- c) EEPROMs can be written to (programmed) as well as read from.
- d) ROM devices must be programmed by the chip manufacturer.

24) How many address lines would be found on a 128-kbyte memory device (assuming that this is arranged as an array of 8-bit registers)?

- a) 13 b) 15 c) 17 d) 19

25) A signal contains components with frequencies up to 10 kHz, although no useful information is contained at frequencies above 6 kHz. What is the minimum frequency at which the signal should be sampled?

- a) 6 kHz. b) 12 kHz. c) 14.4 kHz. d) 20 kHz.

26) When using anti-aliasing filters it is normal to sample somewhat below the Nyquist rate to allow for the non-ideal characteristics of the filters.

- a) True b) False

27) What is the resolution of a 12-bit data converter?

- a) 0.00024% b) 0.0041% c) 0.024% d) 0.41%

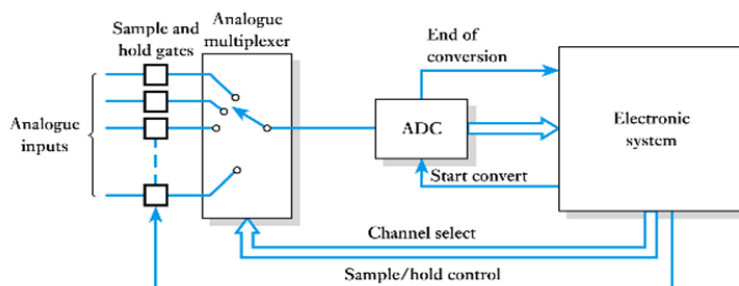
28) What is meant by the “droop” of a sample and hold gate?

- a) The voltage by which the input quantity is lowered during sampling.
b) The rate of decay of the output voltage.
c) The voltage difference between the output voltage and the actual voltage being sampled.
d) The time taken to take a sample.

29) An analogue multiplexer is a form of electrically controlled switch, based on the use of analogue switches.

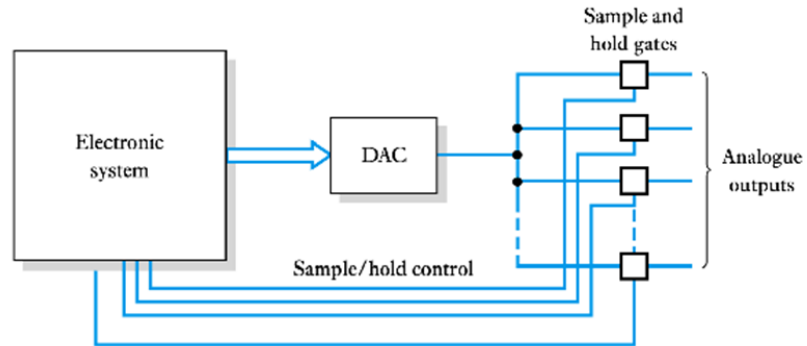
- a) True b) False

30) What is the primary function of the sample and hold gates in the following arrangement?



- a) To allow all the inputs to be sampled simultaneously.
b) To buffer the input signals.
c) To prevent the ADC from distorting the input signals.
d) To block unwanted input signals.

31) What is the primary function of the sample and hold gates in the following arrangement?



- a) To prevent variations in the load from affecting the output voltage.
- b) To hold the outputs constant between updates of the outputs.
- c) To allow the outputs to be updated simultaneously.
- d) To buffer the output signals.