

1501661 - 15/05/2026

Question One

i)

1. and gate
2. or gate
3. not gate
4. xor gate
5. nand gate

iii)

D = A

E = C

IV

Question Two

i)

Binary Table: 128 64 32 16 8 4 2 1

a) $1101\ 0111 = 128 + 64 + 0 + 16 + 0 + 4 + 2 + 1 = 215$

b) $0010\ 0101 = 0 + 0 + 32 + 0 + 0 + 4 + 0 + 1 = 37$

ii)

Decimal: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Hexadecimal: 1 2 3 4 5 6 7 8 9 A B C D E F

Formula: $ab = (a \times 16^1) + (b \times 16^0)$

a) 6F

6 in hex = 6

F in hex = 15

$$16^1 = 16$$

$$6 \times 16 = (6 \times 10 = 60) + (6 \times 6 = 36) = 96$$

$$16^0 = 1$$

$$15 \times 1 = 15$$

$$6F = 96 + 15 = 111$$

1/2

b) EA

$$E \text{ in hex} = 14$$

$$A \text{ in hex} = 10$$

$$16^1 = 16$$

$$14 \times 16 = (14 \times 10 = 140) + (10 \times 6 = 60) + (4 \times 6 = 24) = 224$$

$$16^0 = 1$$

$$10 \times 1 = 10$$

$$EA = 224 + 10 = 234$$

1/2

iii)

Binary Table: 128 64 32 16 8 4 2 1

a) 84

$$84 / 2 = 42 \text{ rem } 0$$

$$42 / 2 = 21 \text{ rem } 0$$

$$21 / 2 = 10 \text{ rem } 1$$

$$10 / 2 = 5 \text{ rem } 0$$

$$5 / 2 = 2 \text{ rem } 1$$

$$2 / 2 = 1 \text{ rem } 0$$

$$1 / 2 = 0 \text{ rem } 1$$

$$0001 \ 0101 \text{ reversed} = 0101 \ 0100$$

$$84 = 0101 \ 0100$$

1/2

10101000

b) 246

$$246 / 2 = 123 \text{ rem } 0$$

$$123 / 2 = 62 \text{ rem } 1$$

$$62 / 2 = 31 \text{ rem } 0$$

$$31 / 2 = 15 \text{ rem } 1$$

$$15 / 2 = 7 \text{ rem } 1$$

$$7 / 2 = 3 \text{ rem } 1$$

$$3 / 2 = 1 \text{ rem } 1$$

$$1 / 2 = 0 \text{ rem } 1$$

$$0101\ 1111 \text{ reversed} = 1111\ 1010$$

$$246 = 1111\ 1010$$

2/2

v)

$$32+16+8+4+2+1 = 65$$

1/2

vi)

Binary Table: 2048 1024 512 256 128 64 32 16 8 4 2 1

$$1 \text{ kilobyte} = 1024 \text{ bytes}$$

$$1024 \text{ in decimal} = 0100\ 0000\ 0000$$

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Question Three

a) Ryzen 7900x CPU or equivalent

This CPU has a large number of cores. For multithreaded tasks, such as rendering 3D scenes and models or compiling code, this is preferable to a CPU with fewer cores, even if higher clock speeds are available.

b) 64GB

Complex 3D scenes may require many gigabytes of memory during rendering and, if they exceed the size of the system memory, the software may start to use the internal storage as cache. This can greatly reduce the speed of rendering, as the internal storage has much slower read/write speeds than the system memory.

c) 1tb NVME SSD

Neither 3D models nor code require a great amount of internal storage. However, the speed of the internal storage will impact the time it takes to load files in and out of system memory during rendering or compiling. For this reason, a modest sized NVME SSD with high read/write speeds is preferable to a larger SATA drive with slower read/write speeds.

d) USBs

The PC will require USB ports for connecting a keyboard and mouse, as well as an HDMI or Display Port for connecting a monitor and speakers.

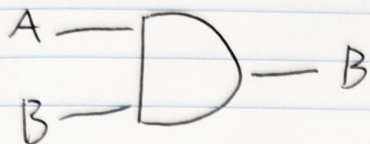
e) 12+ GB of VRAM, CUDA and/or OPTIX API, Ray Tracing and Machine Learning Cores

Both 3D rendering and machine learning make extensive use of the GPU's VRAM. For this reason, prioritising a large amount of VRAM is preferable. Modern GPUs have special cores to enable hardware accelerated machine learning and ray tracing, which can greatly improve the speed of certain 3D modelling and software development tasks. Software designed to make use of this hardware usually support Nvidia's CUDA and OPTIX APIs.

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Question One

ii)



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