a) ① 51.1875_{10}

$51/2 = 25$ R1 $0.1875 \times 2 = 0.375$

$25/2 = 12$ R1 $0.375 \times 2 = 0.75$

$12/2 = 6$ R0 $0.75 \times 2 = 1.5$

$6/2 = 3$ R0 $.5 \times 2 = 1.0$

$3/2 = 1$ R1

$1/2 = 0$ R1

51.1875_{10} $\boxed{= 11 0011 . 0011_2}$

$= 0.1100 1 1 0011 \times 2^6$

11001100	11000000	00000000	00000110

   C   C   C   0   0   0   0   6

$\boxed{CCC 00606}$ $11 0011 . 0011_2$ $\boxed{\begin{array}{l} = 33.3_{16} \\ = 63.14_8 \end{array}}$

② 3.19921875_{10}

$3/2 = 1$ R1 $0.19921875 \times 2 = 0.3984375$

$1/2 = 0$ R1 $0.3984375 \times 2 = 0.796875$

               $0.796875 \times 2 = 1.59375$

               $0.59375 \times 2 = 1.1875$

               $0.1875 \times 2 = 0.375$

               $0.375 \times 2 = 0.75$

               $0.75 \times 2 = 1.5$

               $.5 \times 2 = 1.0$

3.19921875_{10} $\boxed{\begin{array}{l} = 11 . 00110011_2 \\ = 3.146_8 \\ = 3.33_{16} \end{array}}$

$$11.00110011_2 \longrightarrow 0.1100110011 \times 2^2$$

$$1100110 0 \mid 1100 0000 \mid 00000000 \mid 00000010$$

$$C \quad C \quad 0 \quad C \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 2$$

$$\boxed{CC00002_{16}}$$

③ 0.2_{10}

$0.2 \times 2 = 0.4$ $\quad 0.2_{10} = \boxed{\begin{array}{l} = 0.\overline{0011}_2 \\ = 0.\overline{14}_8 \\ = 0.\overline{3}_{16} \end{array}}$

$0.4 \times 2 = 0.8$

$0.8 \times 2 = 1.6$

$0.6 \times 2 = 1.2$

$0.2 \times 2 = 0.4$ $\quad 0.00110011_2 = 0.110011 \times 2^{-2}$

$0.4 \times 2 = 0.8$

$0.8 \times 2 = 1.6$ $\qquad\qquad\qquad 00000010$

$0.6 \times 2 = 1.2$ $\qquad\qquad\qquad \dfrac{1111101}{11111110}$

$$1100 1100 \mid 1100 1100 \mid 11001100 \mid 11111110$$

$$C \quad C \quad C \quad C \quad C \quad C \quad F \quad E$$

$$\boxed{CCCCCCFE_{16}}$$

⑥ $0\ 0011\ 0011\ 0011 \mid 0011\ 1111 \mid 1111\ 1111 \mid 00000000$

$$3 \quad 3 \quad 3 \quad F \quad 0 \quad F \quad F \quad 0 \quad 6$$

$$\underline{\qquad\qquad\qquad\qquad +1 \qquad\qquad}$$

$$3 \quad 3 \quad 4 \quad 0 \quad 0 \quad 0 \quad 0 \quad 6$$

$$\boxed{33400F9} \qquad \boxed{33400006_{16}}$$

② 0011 0011 | 0011 1111 | 1111 1111 | 0010 0010

   3   3   3   F   F   F   0   2
                                    +1
_____
   3   3   0   4   0   0   0   2

$$\boxed{33400002_{16}}$$

③ 0011 0011 | 0011 0011 | 0011 0011 | 1111 1110

   3   3   3   3   3   3   F   E
                                +1
_____
   3   3   3   3   3   4   F   E

$$\boxed{333334FE_{16}}$$

_____

C) ① 69999902

0110 1001 | 1001 1001 | 1001 1001 | 0000 0010

$0.0110\ \overline{1001} \times 2^2$
$= 1.10\overline{1001}_2$

$1.10\overline{1001}_2 = (1\times2^0) + (1\times2^{-1}) + (1\times2^{-3})$
$\qquad\qquad\qquad + (1\times2^{-6})$

$= 1 + 0.5 + 0.125 + 0.015625$
$$\boxed{= 1.640625_{10}}$$

② 69999903_{16}

$= 0.0110\overline{1001} \times 2^3$

$= 11.0\overline{1001}_2$

$11.0\overline{1001}_2 = (1 \times 2^1) + (1 \times 2^0) + (1 \times 2^{-2}) + (1 \times 2^{-5})$

$\qquad = 2 + 1 + 0.25 + 0.03125$

$\qquad \boxed{= 3.28125_{10}}$

③ $966667FF_{16}$

$\overset{\uparrow}{1}001\underline{0}110|\underline{0}1100110|\underline{0}110\underline{0}111|11111111$

$= 0.1001\,0110\,0110\,0110\,0110\,0111 \times 2^1$

$\qquad\qquad\qquad\qquad\qquad\qquad 11111111$

$= 1.001\,0110\,0110\,0110\,0110\,0111$

$\qquad\qquad\qquad\qquad\qquad 00000000$

$\qquad\qquad\qquad\qquad\qquad 00000001$

$= (1 \times 2^0) + (1 \times 2^{-3}) + (1 \times 2^{-5}) + (1 \times 2^{-6}) + (1 \times 2^{-9}) + (1 \times 2^{-10})$

$\quad + (1 \times 2^{-13}) + (1 \times 2^{-14}) + (1 \times 2^{-17}) + (1 \times 2^{-18}) + (1 \times 2^{-21})$

$\quad + (1 \times 2^{-22}) + (1 \times 2^{-23})$

$= 0.125 + 0.03125 + 0.015625 + .001953125 + 0.0009765625 + \ldots$

$\boxed{= 1.1750000715255737373047_{10}}$