QUESTION ONE *(15 Marks)* Marks

(a) Evaluate $\dfrac{\sqrt{24.1 - 15.8}}{14 \times 23 - 25}$, correct to 4 significant figures. **2**

(b) Simplify:

(i) $(2b^3)^4$ **1**

(ii) $y^{\frac{1}{2}} \times y^{\frac{-1}{2}}$ **2**

(c) Write without fractional or negative indices:

(i) $x^{\frac{2}{3}}$ **1**

(ii) $(5x - 3)^{\frac{-1}{2}}$ **1**

(d) Use algebraic techniques to express $0.\dot{1}\dot{7}$ as a fraction in simplest terms. **3**

(e) The speed of light can be approximated as 3×10^8 metres per second. Calculate the time that it would take light to travel from the surface of a cricket ball onto the retina of a spectator sitting 80 metres away. Express your answer in scientific notation to 3 significant figures. **3**

(f) If the cost of an mp3 player is $245.30 including 10% GST, then how much is the cost of the mp3 player without GST? **2**

QUESTION TWO *(23 Marks)* **Start a new page**

(a) Expand and simplify the following:

(i) $(3x - 1)(2x + 3)$ **1**

(ii) $(5 - x)^2$ **1**

(b) Factorise:

(i) $y^2 - y - 90$ **1**

(ii) $12x^2 + 16x - 3$ **2**

(iii) $x^4 + 8x$ **3**

(c) Simplify:

(i) $\dfrac{5}{4k} + \dfrac{k + 1}{k^2}$ **2**

(ii) $\dfrac{x^2 - 1}{x^3 - 1}$ **3**

(d) Simplify fully:

(i) $\sqrt{5}\left(2\sqrt{3} - 5\right)$ **1**

(ii) $5\sqrt{27} - 2\sqrt{75}$ **2**

(e) Evaluate a and b if $\left(2\sqrt{3} + 1\right)^2 = a + \sqrt{b}$ given that a and b are integers. **3**

(f) Express with a rational denominator (in simplest form):

(i) $\dfrac{5\sqrt{7}}{3\sqrt{2}}$ **1**

(ii) $\dfrac{\sqrt{5} + 1}{\sqrt{5} - 1}$ **3**

QUESTION THREE *(20 Marks)* **Start a new page**

(a) Solve for x

(i) $4(3x - 2) - 5 = 35$ **2**

(ii) $\frac{6}{x} = \frac{4}{5} \qquad (x \neq 0)$ **1**

(iii) $5x - 3 \geq -13$ **2**

(iv) $\frac{x + 4}{5} - \frac{x + 2}{3} = -2$ **3**

(b) The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$. Calculate the value of r when the volume of the sphere is $200cm^3$. Give your answer correct to 2 decimal places. **3**

(c) Solve for x

(i) $x^2 - 5x = 0$ **2**

(ii) $4x^2 - 9 = 0$ **2**

(iii) $6x^2 + 13x + 5 = 0$ **3**

(d) Solve for x correct to 3 decimal places:

$x^2 - 5x + 2 = 0$ **2**

END OF PAPER

Question 1

(a) 0.009700 ✓ correct ✓ sig figs

(b)(i) $16b^{12}$ ✓

(ii) $y^0 = 1$ ✓ ✓

(c)(i) $\sqrt[3]{x^2}$ or $\left(\sqrt[3]{x}\right)^2$ ✓

(ii) $\dfrac{1}{\sqrt{5x-3}}$ ✓

(d) let $x = 0.1717\ldots$

$\therefore 100x = 17.1717\ldots$ ✓

$\therefore 99x = 17$ ✓

$\therefore x = 17/99$ ✓

(e) $t = \dfrac{80}{3 \times 10^8}$ ✓

$= 0.000000026\dot{}$ ✓

$= 2.67 \times 10^{-7}$ ✓

(f) 110% is \$245.30

10% is \$22.30 ✓

100% is \$223 ✓

Question 2

(a) (i) $6x^2 + 9x - 2x - 3$

$= 6x^2 + 7x - 3$ ✓

(ii) $25 - 10x + x^2$ ✓

(b) (i) $(y-10)(y+9)$ ✓

(ii) $12x^2 + 16x - 3$

$= 12x^2 + 18x - 2x - 3$ ✓

$= 6x(2x+3) - (2x+3)$

$= (2x+3)(6x-1)$ ✓

(iii) $x(x^3 + 8)$ ✓

$= x(x+2)(x^2 - 2x + 4)$ ✓ ✓

(c) (i) $\frac{5k}{4k^2} + \frac{4k+4}{4k^2}$ ✓

$= \frac{9k+4}{4k^2}$ ✓

(ii) $\frac{(x-1)(x+1)}{(x-1)(x^2+x+1)}$ ✓ ✓

$= \frac{x+1}{x^2+x+1}$ ✓

(d) (i) $2\sqrt{15} - 5\sqrt{5}$ ✓

(ii) $15\sqrt{3} - 10\sqrt{3}$ ✓

$= 5\sqrt{3}$ ✓

(e) $(2\sqrt{3}+1)^2 = a + \sqrt{b}$

$\therefore 12 + 4\sqrt{3} + 1 = a + \sqrt{b}$

$\therefore 13 + 4\sqrt{3} = a + \sqrt{b}$ ✓

$\therefore 13 + \sqrt{48} = a + \sqrt{b}$ ✓

$\therefore a = 13, \quad b = 48$ ✓

(f) (i) $\frac{5\sqrt{14}}{6}$ ✓

(ii) $\frac{(\sqrt{5}+1)(\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)}$ ✓

$= \frac{5 + 2\sqrt{5} + 1}{5-1} = \frac{6 + 2\sqrt{5}}{4} = \frac{3+\sqrt{5}}{2}$ ✓ ✓

Question 3

(a)(i) $12x - 8 - 5 = 35$ ✓

$12x = 48$ ✓

$x = 12$ ✓

(ii) $30 = 4x$ ✓

$x = 7{\cdot}5$ ✓

(iii) $5x \geq -10$ ✓

$x \geq -2$ ✓

(iv) $\frac{3x+12-(5x+10)}{15} = -2$ ✓

$3x + 12 - 5x - 10 = -30$ ✓

$-2x = -32$ ✓

$x = 16$ ✓

(b) $200 = \frac{4\pi r^3}{3}$ ✓

$\frac{150}{\pi} = r^3$

$r = \sqrt[3]{\frac{150}{\pi}}$ ✓

$= 3{\cdot}63 \quad (2\text{d.p.})$ ✓

(c)(i) $x(x-5) = 0$ ✓

$x = 0$ or 5 ✓

(ii) $(2x-3)(2x+3) = 0$ ✓

$x = \pm 3/2$ ✓

(iii) $6x^2 + 10x + 3x + 5 = 0$ ✓

$2x(3x+5) + (3x+5) = 0$

$(3x+5)(2x+1) = 0$ ✓

$x = -5/3$ or $-1/2$ ✓

(d) $x = \frac{5 \pm \sqrt{25 - 8}}{2}$ ✓

$= \frac{5 \pm \sqrt{17}}{2}$

$= 4{\cdot}562 \quad$ or $\quad 0{\cdot}438$ ✓