**7.** A continuous random variable $X$ has cumulative distribution function $F(x)$ given by

$$F(x) = \begin{cases} 0 & x < 1 \\ k(ax + bx^3 - x^4 - 4) & 1 \leqslant x \leqslant 2 \\ 1 & x > 2 \end{cases}$$

where $a$, $b$ and $k$ are non-zero constants.

Given that the mode of $X$ is 1.5

(a) show that $b = 3$

**(3)**

(b) Hence show that $a = 2$

**(1)**

(c) Show that the median of $X$ lies between 1.4 and 1.5

**(4)**

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**(Total for Question 7 is 8 marks)**

**TOTAL FOR PAPER IS 75 MARKS**

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