Question Number	Scheme	Marks
6 (a)	$[\mathrm{F}(k)=1\Rightarrow]ak+bk^2=1\Rightarrow ak=1-bk^2$ *	B1*
		(1)
(b)	$\mathrm{f}(x)=a+2bx$	B1
	$\mathrm{E}(X)=\int_0^k\left(ax+2bx^2\right)\,\mathrm{d}x\left[=\frac{6}{5}\right]\Rightarrow\left[\frac{ax^2}{2}+\frac{2bx^3}{3}\right]_0^k\left[=\frac{6}{5}\right]$	M1
	$\frac{ak^2}{2}+\frac{2bk^3}{3}=\frac{6}{5}$	dM1, A1
	$15ak^2+20bk^3=36$	
	$15k\left(1-bk^2\right)+20bk^3=36$	M1
	$5bk^3=36-15k$ *	A1*
		(6)
(c)	$\mathrm{E}(X^2)=\int_0^k\left(ax^2+2bx^3\right)\,\mathrm{d}x\Rightarrow\left[\frac{ax^3}{3}+\frac{bx^4}{2}\right]_0^k$	M1
	$\mathrm{Var}(X)=\frac{ak^3}{3}+\frac{bk^4}{2}-\frac{36}{25}=\frac{22}{75}$	dM1 A1
	$10ak^3+15bk^4=52$	
	$10k^2\left(1-bk^2\right)+15bk^4=52$	M1
	$5bk^4=52-10k^2$ *	A1*
		(5)
(d)	$\frac{1}{k}=\frac{36-15k}{52-10k^2}$	M1
	$5k^2-36k+52=0$	A1
	$(k-2)(5k-26)=0$	M1
	$k=2$	A1
		(4)
(e)	$'40'b=36-'30'\Rightarrow b=\frac{3}{20}$ or $'80'b=52-'40'\Rightarrow b=\frac{3}{20}$	B1ft
	$2a+\frac{3}{5}=1\Rightarrow a=\frac{1}{5}$	B1ft
		(2)
	Notes	**Total 18**

(a)	**B1***	Answer is given so no incorrect working can be seen
(b)	**B1**	For a correct expression for f(x) (may be implied by a correct expression for E(X)
	M1	For an attempt to integrate x f(x) (Ignore limits) at least one $(x^n\rightarrow x^{n+1})$. F.t. their f(x) f(x) must be a changed expression from F(x) so integrating xF(x) is M0
	dM1	Dependent on the previous M mark. For equating to $\frac{6}{5}$ and substitution of k (no need to see substitution of lower limit 0).
	A1	For a correct equation any form
	M1	For substitution of $ak=1-bk^2$ oe into their equation
	A1*	Answer is given so no incorrect working can be seen

(c)	**M1**	For an attempt to integrate x^2 f(x) (Ignore limits) at least one $(x^n \rightarrow x^{n+1})$ F.t. their f(x) x^2 F(x) is M0
	dM1	Dependent on previous M mark. For substitution of correct limits and subtraction of $\frac{36}{25} = \frac{22}{75}$
	A1	For a correct equation any form
	M1	For substitution of $ak = 1 - bk^2$ oe into their equation
	A1*	Answer is given so no incorrect working can be seen
(d)	**M1**	For solving simultaneously to set up an equation in k only
	A1	For a correct 3 term quadratic
	M1	For solving their 3 term quadratic by factorising, completing the square or using formula. $k = 5.2$ implies M1A1M1
	A1	2 only cao. Correct answer on its own scores 4 out of 4
(e)	**B1ft**	For $b = \frac{3}{20}$ ft their k $\quad b = \frac{36-15k}{5k^3}$ Common ft answer is $b = \frac{-525}{8788} = \text{awrt} -0.0597$ coming from choosing $k = 5.2$
	B1ft	For $a = \frac{1}{5}$ ft their k and their b $\quad a = \frac{1-bk^2}{k}$ Common ft answer is $a = \frac{85}{169} = \text{awrt } 0.503$ coming from choosing $k = 5.2$

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom