Question Number	Scheme	Marks
4	$\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}-8\dfrac{\mathrm{d}y}{\mathrm{d}x}+16y=48x^2-34$	
(a)	$(\text{AE:})\quad m^2-8m+16=0$ $\left[\Rightarrow (m-4)^2=0\right]$ $\Rightarrow m=4$	M1
	$(\text{CF: } y=)\quad (A+Bx)\mathrm{e}^{4x}$	A1
	$(\text{PI: } y=)\quad \lambda x^2+\mu x+\nu$	B1
	$y'=2\lambda x+\mu \quad y''=2\lambda$ $2\lambda-8(2\lambda x+\mu)+16(\lambda x^2+\mu x+\nu)=48x^2-34$ $16\lambda x^2=48x^2\ (-16\lambda+16\mu)x=0\quad 2\lambda-8\mu+16\nu=-34$ $\lambda=3\quad \mu=3\quad \nu=-1$	M1
	$y=\text{"}(A+Bx)\mathrm{e}^{4x}\text{"}+3x^2+3x-1$	A1ft
		(5)
(b)	$(0,4)\Rightarrow 4=A-1\quad (A=5)$	M1
	$\dfrac{\mathrm{d}y}{\mathrm{d}x}=4(A+Bx)\mathrm{e}^{4x}+B\mathrm{e}^{4x}+6x+3$	M1
	$21=4A+B+3\Rightarrow B=-2\quad A=5$ $[y]=(5-2x)\mathrm{e}^{4x}+3x^2+3x-1$	M1A1
		(4)
(c)	$(x=-2\Rightarrow y=)\ 9\mathrm{e}^{-8}+5$	M1 A1
		(2)
		Total 11

Notes

(a)

M1: Forms the auxiliary equation (condone one slip/copying error) and solves 3TQ. Usual rules. One consistent solution if no working (could be complex). Implied by a correct CF if no incorrect working shown.

A1: Correct complementary function *y* = ... not required. May only be seen in final answer.

B1: Correct form for particular integral *y* = ... not required.

M1: Correct method to obtain value for constants (or constant - but PI must be a quadratic - but could have 1 or 2 terms) - so differentiates twice (powers reduced) and substitutes, equates terms and solves equations. Allow if there are minor slips in the process if the holistic approach is correct.

A1ft: A correct general solution following through on their CF only - the PI must be correct. Must have " *y* = " e.g., not " GS = "

(b)

M1: Uses (0, 4) in their answer to (a) and forms an equation in one or both of their constants.

M1: Differentiates their GS, which must contain a term $\text{"}Bxe^{kx}\text{"}$, to obtain an expression of the correct form for their GS - product rule must be used, powers reduced, but may have errors in coefficients.

M1: Substitutes $x=0,\ \dfrac{\mathrm{d}y}{\mathrm{d}x}=21$ into their equation where their derivative is a changed function and finds values for their *B* (and their *A* if not found already).

A1: Any correct equation Condone e.g., " PS =... "

(c)

M1: Substitutes *x* = –2 into their particular solution and obtains an expression of the right form or non-zero values for *p*, *q* and *r*, which need not be integers for the M but should be gathered terms. Implied by a correct answer as long as it fits their answer to (b) if no method shown.

A1: Correct expression or values