

WINTER – 2018 EXAMINATION

Subject Name: Applied Mathematics

Model Answer

Subject Code:

22224

Important Instructions to Examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answer and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.		Solve any <u>FIVE</u> of following:	10
	a)	If $f(x) = x^3 - x$, find $f(1) + f(2)$	02
	Ans	$f(x) = x^3 - x$ $\therefore f(1) = (1)^3 - (1) = 0$ $\therefore f(2) = (2)^3 - (2) = 6$ $\therefore f(1) + f(2) = 0 + 6$ $\therefore f(1) + f(2) = 6$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
b)	State whether the function $f(x) = x^3 - 3x + \sin x + x \cdot \cos x$ is even or odd.	02	
Ans	$f(x) = x^3 - 3x + \sin x + x \cdot \cos x$ $\therefore f(-x) = (-x)^3 - 3(-x) + \sin(-x) + (-x) \cdot \cos(-x)$ $= -x^3 + 3x - \sin x - x \cdot \cos x$ $= -(x^3 - 3x + \sin x + x \cdot \cos x)$ $= -f(x)$ \therefore Function is odd.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
c)	Find $\frac{dy}{dx}$ if $y = e^{2x} \cdot \log(x+1)$		02

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1.	c)	$y = e^{2x} \cdot \log(x+1)$	
	Ans	$\therefore \frac{dy}{dx} = e^{2x} \cdot \frac{1}{x+1} + \log(x+1) \cdot e^{2x} \cdot 2$ $= \frac{e^{2x}}{x+1} + 2e^{2x} \log(x+1)$	1+1
	d)	Evaluate $\int \left(e^{2x} + \frac{1}{1+x^2} \right) dx$	02
	Ans	$\int \left(e^{2x} + \frac{1}{1+x^2} \right) dx$ $= \frac{e^{2x}}{2} + \tan^{-1} x + c$	1+1
	e)	Evaluate $\int \frac{dx}{9x^2 - 16}$	02
	Ans	$\int \frac{dx}{9x^2 - 16} = \frac{1}{9} \int \frac{dx}{x^2 - \frac{16}{9}}$ $= \frac{1}{9} \int \frac{dx}{x^2 - \left(\frac{4}{3}\right)^2}$ $= \frac{1}{9} \cdot \frac{1}{2 \cdot \frac{4}{3}} \log \left(\frac{x - \frac{4}{3}}{x + \frac{4}{3}} \right) + c$ $= \frac{1}{24} \log \left(\frac{3x-4}{3x+4} \right) + c$	1/2
	OR		
		$\int \frac{dx}{9x^2 - 16} = \int \frac{dx}{(3x)^2 - (4)^2}$ $= \frac{1}{2(4)} \cdot \frac{1}{3} \log \left(\frac{3x-4}{3x+4} \right) + c$ $= \frac{1}{24} \log \left(\frac{3x-4}{3x+4} \right) + c$	1
			1

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1.	f)	Find the area enclosed by the curve $y = x^3$, x -axis and the ordinates $x = 1$ and $x = 3$	02
	Ans	$\text{Area } A = \int_a^b y dx$ $= \int_1^3 x^3 dx$ $= \left[\frac{x^4}{4} \right]_1^3$ $= \frac{(3)^4}{4} - \frac{(1)^4}{4}$ $= \frac{81}{4} - \frac{1}{4}$ $= 20$	<p>½</p> <p>½</p> <p>½</p> <p>½</p>
2.	g)	Show that the root of $x^3 - 9x + 1 = 0$ lies between 2 and 3.	02
	Ans	$f(x) = x^3 - 9x + 1$ $f(2) = (2)^3 - 9(2) + 1 = -9 < 0$ $f(3) = (3)^3 - 9(3) + 1 = 1 > 0$ <p>∴ Root lies between 2 and 3</p>	<p>1</p> <p>1</p>
		Solve any THREE of the following:	12
	a)	If $x^2 + y^2 + 2xy - y = 0$ find $\frac{dy}{dx}$ at (1, 2)	04
	Ans	$x^2 + y^2 + 2xy - y = 0$ $2x + 2y \frac{dy}{dx} + 2 \left(x \frac{dy}{dx} + y \right) - \frac{dy}{dx} = 0$ $2x + 2y \frac{dy}{dx} + 2x \frac{dy}{dx} + 2y - \frac{dy}{dx} = 0$ $2y \frac{dy}{dx} + 2x \frac{dy}{dx} - \frac{dy}{dx} = -2x - 2y$ $(2y + 2x - 1) \frac{dy}{dx} = -2x - 2y$ $\frac{dy}{dx} = \frac{-2x - 2y}{2y + 2x - 1} = \frac{-2(x + y)}{2y + 2x - 1}$ $\left(\frac{dy}{dx} \right)_{(1,2)} = \frac{-2(1+2)}{2(2)+2(1)-1} = \frac{-6}{5} \quad \text{OR} \quad -1.2$	<p>2</p> <p>1</p> <p>1</p>

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2.	b)	<p>If $x = a(2\theta - \sin 2\theta)$, $y = a(1 - \cos 2\theta)$ find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$</p> <p>Ans $x = a(2\theta - \sin 2\theta)$ $y = a(1 - \cos 2\theta)$</p> <p>$\therefore \frac{dx}{d\theta} = a(2 - 2\cos 2\theta)$ $\frac{dy}{d\theta} = 2a \sin 2\theta$</p> <p>$\therefore \frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}}$</p> <p>$\therefore \frac{dy}{dx} = \frac{2a \sin 2\theta}{2a(1 - \cos 2\theta)} = \frac{\sin 2\theta}{(1 - \cos 2\theta)}$ OR $\frac{dy}{dx} = \frac{\sin 2\theta}{(1 - \cos 2\theta)} = \frac{2 \sin \theta \cos \theta}{2 \sin^2 \theta} = \cot \theta$</p> <p>at $\theta = \frac{\pi}{4}$</p> <p>$\therefore \frac{dy}{dx} = \frac{\sin 2\left(\frac{\pi}{4}\right)}{\left(1 - \cos 2\left(\frac{\pi}{4}\right)\right)} = \frac{\sin\left(\frac{\pi}{2}\right)}{\left(1 - \cos\left(\frac{\pi}{2}\right)\right)}$</p> <p>$\therefore \frac{dy}{dx} = \frac{1}{1-0} = 1$ OR $\frac{dy}{dx} = \cot \frac{\pi}{4} = 1$</p>	<p>04</p> <p>1+1</p> <p>1</p> <p>1</p>
	c)	<p>Find the maximum and minimum value of $y = x^3 - \frac{15}{2}x^2 + 18x$</p> <p>Ans Let $y = x^3 - \frac{15}{2}x^2 + 18x$</p> <p>$\therefore \frac{dy}{dx} = 3x^2 - 15x + 18$</p> <p>$\therefore \frac{d^2y}{dx^2} = 6x - 15$</p> <p>Consider $\frac{dy}{dx} = 0$</p> <p>$3x^2 - 15x + 18 = 0$</p> <p>$x^2 - 5x + 6 = 0$</p> <p>$\therefore x = 2$ or $x = 3$</p> <p>at $x = 2$</p> <p>$\frac{d^2y}{dx^2} = 6(2) - 15 = -3 < 0$</p> <p>$\therefore y$ is maximum at $x = 2$</p> <p>$y_{\max} = (2)^3 - \frac{15}{2}(2)^2 + 18(2) = 14$</p>	<p>04</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p>

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2.	c)	at $x = 3$ $\frac{d^2y}{dx^2} = 6(3) - 15 = 3 < 0$ $\therefore y$ is minimum at $x = 3$ $y_{\min} = (3)^3 - \frac{15}{2}(3)^2 + 18(3) = 13.5$	$\frac{1}{2}$ $\frac{1}{2}$
	d)	A beam is bent in the form of the curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature of the beam at the point $x = \frac{\pi}{2}$ Ans $y = 2 \sin x - \sin 2x$ $\therefore \frac{dy}{dx} = 2 \cos x - 2 \cos 2x$ $\therefore \frac{d^2y}{dx^2} = -2 \sin x + 4 \sin 2x$ $\left(\frac{dy}{dx}\right)_{\left(x=\frac{\pi}{2}\right)} = 2 \cos\left(\frac{\pi}{2}\right) - 2 \cos 2\left(\frac{\pi}{2}\right) = 2(0) - 2(-1) = 2$ $\left(\frac{d^2y}{dx^2}\right)_{\left(x=\frac{\pi}{2}\right)} = -2 \sin\left(\frac{\pi}{2}\right) + 4 \sin 2\left(\frac{\pi}{2}\right) = -2(1) + 4(0) = -2$ \therefore Radius of curvature is $\rho = \frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ $\therefore \rho = \frac{\left[1 + (2)^2\right]^{\frac{3}{2}}}{-2}$ $\therefore \rho = -5.59$ $\therefore \rho = 5.59$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 04 1 1
3.		Solve any <u>THREE</u> of the following:	12
	a)	Find the equation of tangent and normal to the curve $2x^2 - xy + 3y^2 = 18$ at the point $(3,1)$ Ans $2x^2 - xy + 3y^2 = 18$ $4x - \left(x \frac{dy}{dx} + y\right) + 6y \frac{dy}{dx} = 0$	04 $\frac{1}{2}$

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3.	a)	$4x - x \frac{dy}{dx} - y + 6y \frac{dy}{dx} = 0$ $-x \frac{dy}{dx} + 6y \frac{dy}{dx} = -4x + y$ $(-x + 6y) \frac{dy}{dx} = -4x + y$ $\frac{dy}{dx} = \frac{-4x + y}{-x + 6y}$ at (3,1) Slope of tangent = $\frac{dy}{dx} = \frac{-4(3)+1}{-3+6(1)} = \frac{-11}{3}$ Slope of normal = $\frac{-1}{\frac{dy}{dx}} = \frac{3}{11}$ Equation of tangent $y - y_1 = m(x - x_1)$ $y - 1 = \frac{-11}{3}(x - 3)$ $3y - 3 = -11x + 33$ $11x + 3y - 36 = 0$ Equation of normal $y - y_1 = m(x - x_1)$ $y - 1 = \frac{3}{11}(x - 3)$ $11y - 11 = 3x - 9$ $3x - 11y + 2 = 0$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p>
	b)	A manufacturer can sell x items at a price of Rs. $(330 - x)$ each. The cost of producing x items is Rs. $x^2 + 10x + 12$. Determine the number of items to be sold so that the manufacturer can make the maximum profit.	04
	Ans	Selling price of x items = $(330 - x)x = 330x - x^2$ Cost price of x items = $x^2 + 10x + 12$ Profit = Selling price - Cost price Let $P = (330x - x^2) - (x^2 + 10x + 12)$ $= 330x - x^2 - x^2 - 10x - 12$	



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3.	b)	$P = 320x - 2x^2 - 12$ $\therefore \frac{dP}{dx} = 320 - 4x$ Put $\frac{dP}{dx} = 0$ $320 - 4x = 0$ $\therefore x = 80$ $\frac{d^2P}{dx^2} = -4 < 0$ $\therefore \text{For maximum profit manufacturer can sell 80 items.}$	1 1 1 1
	c)	If $x^y = e^{x-y}$ then prove that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$	04
	Ans	$x^y = e^{x-y}$ $\log x^y = \log e^{x-y}$ $y \log x = (x - y) \log e$ $y \log x = x - y$ $y \log x + y = x$ $y(\log x + 1) = x$ $y = \frac{x}{1 + \log x}$ $\frac{dy}{dx} = \frac{(1 + \log x)(1) - x\left(\frac{1}{x}\right)}{(1 + \log x)^2}$ $\frac{dy}{dx} = \frac{1 + \log x - 1}{(1 + \log x)^2}$ $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$	1/2 1/2 1 1
d)	Evaluate $\int \frac{dx}{2x + x \cdot \log x}$	04	
Ans	$I = \int \frac{dx}{2x + x \cdot \log x}$ $= \int \frac{dx}{x(2 + \log x)}$	1/2	

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3.	d)	$\text{Put } 2 + \log x = t \quad \text{OR} \quad \text{Put } \log x = t$ $\frac{1}{x} dx = dt \quad \frac{1}{x} dx = dt$ $\therefore I = \int \frac{dt}{t} \quad \therefore I = \int \frac{dt}{2+t}$ $= \log t + c \quad = \log(2+t) + c$ $= \log(2 + \log x) + c \quad = \log(2 + \log x) + c$	<p>½</p> <p>1</p> <p>½</p> <p>1</p> <p>½</p>
4.		<p>Solve any THREE of the following:</p> <p>a) Evaluate : $\int \frac{dx}{x^2 + 4x + 25}$</p> <p>Ans $I = \int \frac{dx}{x^2 + 4x + 25}$</p> $T.T. = \left(\frac{1}{2} \times \text{Coeff. of } x\right)^2 = \left(\frac{1}{2} \times 4\right)^2 = 4$ $x^2 + 4x + 25 = x^2 + 4x + 4 - 4 + 25$ $= (x+2)^2 + 21 = (x+2)^2 + (\sqrt{21})^2$ $\therefore I = \int \frac{dx}{(x+2)^2 + (\sqrt{21})^2}$ $= \frac{1}{\sqrt{21}} \tan^{-1} \left(\frac{x+2}{\sqrt{21}} \right) + c$ <p>OR $I = \int \frac{dx}{x^2 + 4x - 4 + 4 + 25}$</p>	<p>12</p> <p>04</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
	b)	<p>Ans Evaluate $\int \frac{dx}{2 + 3 \cos 2x}$</p> $I = \int \frac{dx}{2 + 3 \cos 2x}$ <p>Put $t = \tan x$, $\cos 2x = \frac{1-t^2}{1+t^2}$ and $dx = \frac{dt}{1+t^2}$</p> $\therefore I = \int \frac{\frac{dt}{1+t^2}}{2 + 3 \left(\frac{1-t^2}{1+t^2} \right)}$ $= \int \frac{\frac{dt}{1+t^2}}{\frac{2(1+t^2) + 3(1-t^2)}{1+t^2}}$ $= \int \frac{dt}{2 + 2t^2 + 3 - 3t^2}$	<p>04</p> <p>1</p> <p>½</p>

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4.	b)	$= \int \frac{dt}{5-t^2}$ $= \int \frac{dt}{(\sqrt{5})^2 - t^2}$ $= \frac{1}{2(\sqrt{5})} \log \left(\frac{\sqrt{5}+t}{\sqrt{5}-t} \right) + c$ $= \frac{1}{2(\sqrt{5})} \log \left(\frac{\sqrt{5}+\tan x}{\sqrt{5}-\tan x} \right) + c$	1 1 ½
	c)	Evaluate $\int x \cdot \tan^{-1} x dx$	04
	Ans	$\int x \cdot \tan^{-1} x dx$ $= \int \tan^{-1} x \cdot x dx$ $= \tan^{-1} x \int x dx - \int \left(\int x dx \frac{d(\tan^{-1} x)}{dx} \right) dx$ $= \tan^{-1} x \left(\frac{x^2}{2} \right) - \int \left(\frac{x^2}{2} \right) \frac{1}{1+x^2} dx$ $= \frac{x^2 \tan^{-1} x}{2} - \frac{1}{2} \int \frac{x^2}{1+x^2} dx$ $= \frac{x^2 \tan^{-1} x}{2} - \frac{1}{2} \int \frac{1+x^2-1}{1+x^2} dx$ $= \frac{x^2 \tan^{-1} x}{2} - \frac{1}{2} \int \left(1 - \frac{1}{1+x^2} \right) dx$ $= \frac{x^2 \tan^{-1} x}{2} - \frac{1}{2} (x - \tan^{-1} x) + c$	1 1 1 1
	d)	Evaluate $\int \frac{x^2+1}{(x+1)(x+2)(x-3)} dx$	04
	Ans	$\frac{x^2+1}{(x+1)(x+2)(x-3)} = \frac{A}{x+1} + \frac{B}{x+2} + \frac{C}{x-3}$ $\therefore x^2+1 = A(x+2)(x-3) + B(x+1)(x-3) + C(x+1)(x+2)$	½

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4.	d)	Put $x = -1 \quad \therefore A = \frac{-1}{2}$ Put $x = -2 \quad \therefore B = 1$ Put $x = 3 \quad \therefore C = \frac{1}{2}$ $\therefore \int \frac{x^2 + 1}{(x+1)(x+2)(x-3)} dx = \int \frac{\frac{-1}{2}}{x+1} + \frac{1}{x+2} + \frac{\frac{1}{2}}{x-3} dx$ $\therefore \int \frac{x^2 + 1}{(x+1)(x+2)(x-3)} dx = \frac{-1}{2} \log(x+1) + \log(x+2) + \frac{1}{2} \log(x-3) + c$	½ ½ ½ ½ ½+½+½
	e)	Evaluate $\int_0^{\pi/2} \frac{dx}{1 + \sqrt[3]{\tan x}}$ Ans $\int_0^{\pi/2} \frac{dx}{1 + \sqrt[3]{\tan x}}$ $= \int_0^{\pi/2} \frac{dx}{1 + \sqrt[3]{\frac{\sin x}{\cos x}}}$ $= \int_0^{\pi/2} \frac{dx}{1 + \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\cos x}}}$ $= \int_0^{\pi/2} \frac{dx}{\frac{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}}{\sqrt[3]{\cos x}}}$ $I = \int_0^{\pi/2} \frac{\sqrt[3]{\cos x}}{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}} dx \quad \text{----- (1)}$ $= \int_0^{\pi/2} \frac{\sqrt[3]{\cos\left(\frac{\pi}{2} - x\right)}}{\sqrt[3]{\cos\left(\frac{\pi}{2} - x\right)} + \sqrt[3]{\sin\left(\frac{\pi}{2} - x\right)}} dx \quad \text{-----By property}$ $I = \int_0^{\pi/2} \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\sin x} + \sqrt[3]{\cos x}} dx \quad \text{----- (2)}$ Add (1) and (2)	04 1 1

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4.	e)	$I + I = \int_0^{\pi/2} \frac{\sqrt[3]{\cos x}}{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}} dx + \int_0^{\pi/2} \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\sin x} + \sqrt[3]{\cos x}} dx$ $2I = \int_0^{\pi/2} \frac{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}}{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}} dx$ $2I = \int_0^{\pi/2} 1 dx$ $2I = [x]_0^{\pi/2}$ $2I = \frac{\pi}{2}$ $\therefore I = \frac{\pi}{4}$	1
5.	a)	<p>Solve any TWO of the following:</p> <p>Find the volume of the solid generated by revolving the ellipse</p> $\frac{x^2}{9} + \frac{y^2}{4} = 1 \text{ about the } x\text{-axis}$ <p>Ans</p> $\frac{x^2}{9} + \frac{y^2}{4} = 1$ $\therefore \frac{y^2}{4} = 1 - \frac{x^2}{9}$ $\therefore y^2 = \frac{4}{9}(9 - x^2)$ <p>Volume of the solid generated by revolving the ellipse about the x-axis is given by</p> $V = \pi \int_{x=-3}^{x=3} y^2 dx$ $= \pi \int_{-3}^3 \frac{4}{9}(9 - x^2) dx$ $= 2\pi \int_0^3 \frac{4}{9}(9 - x^2) dx \quad \because \text{Function is even}$ $= 2\pi \frac{4}{9} \left(9x - \frac{x^3}{3} \right)_0^3$ $= \frac{8\pi}{9} \left[\left(9(3) - \frac{(3)^3}{3} \right) - 0 \right]$ $= \frac{8\pi}{9} (27 - 9)$ $= 16\pi$	12 06 1 1 1 1 1

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5.	b)	Solve the following.	06
	(i)	Form the differential equation by eliminating the arbitrary constants if $y^2 = 4ax$	03
	Ans	$y^2 = 4ax$ -----(1)	
		$2y \frac{dy}{dx} = 4a$ -----(2)	1
		Put (2) in (1)	
		$\therefore y^2 = 2y \frac{dy}{dx} x$	1
		$\therefore y = 2x \frac{dy}{dx}$	
		$\therefore 2x \frac{dy}{dx} - y = 0$	1

	(ii)	Solve $(1+x^2)dy - (1+y^2)dx = 0$	03
Ans	$(1+x^2)dy - (1+y^2)dx = 0$		
	$(1+x^2)dy = (1+y^2)dx$		
	$\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$	1	
	\therefore Solution is,	1	
	$\int \frac{dy}{1+y^2} = \int \frac{dx}{1+x^2}$	1	
	$\tan^{-1} y = \tan^{-1} x + c$		

c)	A resistance of 100Ω and inductance of 0.1 henries are connected in series with a battery of 20 volts. find the current in the circuit at any instant, if the relation between L,R and E is $L \frac{di}{dt} + Ri = E$	06	
Ans	$L \frac{di}{dt} + Ri = E$	$\frac{1}{2}$	
	$\therefore \frac{di}{dt} + \frac{R}{L}i = \frac{E}{L}$ Comparing with $\frac{dy}{dx} + Py = Q$		
	$\therefore P = \frac{R}{L}$ and $Q = \frac{E}{L}$	1	
	$IF = e^{\int \frac{R}{L} dt} = e^{\frac{R}{L}t}$		
	\therefore Solution is $i \cdot IF = \int Q \cdot IF dt + c$	1	
	$i \cdot e^{\frac{R}{L}t} = \int \frac{E}{L} e^{\frac{R}{L}t} dt + c$		

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5.	c)	$i \cdot e^{\frac{R}{L}t} = \frac{E}{L} \frac{e^{\frac{R}{L}t}}{R} + c$	1
		$i \cdot e^{\frac{R}{L}t} = \frac{E}{R} e^{\frac{R}{L}t} + c$ <p>Initially at $t = 0, i = 0 \therefore c = \frac{-E}{R}$</p> $\therefore i \cdot e^{\frac{R}{L}t} = \frac{E}{R} e^{\frac{R}{L}t} + \left(\frac{-E}{R} \right)$ $i = \frac{E}{R} \left(1 - e^{-\frac{R}{L}t} \right)$ <p>When $R=100, L = 0.1, E= 20$</p> $i = \frac{20}{100} \left(1 - e^{-\frac{100}{0.1}t} \right)$ $i = 0.2 \left(1 - e^{-1000t} \right)$	1/2
6.	a)	<p>Solve any TWO of the following:</p> <p>Solve the following</p>	12
		<p>(i) Find the approximate root of the equation $x^2 + x - 3 = 0$ in the interval (1,2) by using Bisection method (use two iterations)</p> <p>Ans $x^2 + x - 3 = 0$ $f(x) = x^2 + x - 3$ $f(1) = -1 < 0$ $f(2) = 3 > 0$ root is in (1,2) $\therefore x_1 = \frac{1+2}{2} = 1.5$ $\therefore f(1.5) = 0.75 > 0$ \therefore root is in (1,1.5) $\therefore x_2 = \frac{1+1.5}{2} = 1.25$ OR $x^2 + x - 3 = 0$ $f(x) = x^2 + x - 3$ $f(1) = -1 < 0$ $f(2) = 3 > 0$</p>	06 03
			1
			1
			1

OUR CENTERS :

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WINTER – 2018 EXAMINATION

Subject Name: Applied Mathematics

Model Answer

Subject Code:

22224

Q. No.	Sub Q. N.	Answer	Marking Scheme
6.	c)	$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 2 - \frac{f(2)}{f'(2)} = 2.1$ $x_2 = 2.1 - \frac{f(2.1)}{f'(2.1)} = 2.095$ $x_3 = 2.095 - \frac{f(2.095)}{f'(2.095)} = 2.095$ $x_4 = 2.095 - \frac{f(2.095)}{f'(2.095)} = 2.095$ <p>OR</p> $f(x) = x^3 - 2x - 5$ $f(2) = -1 < 0$ $f(3) = 16 > 0$ <p>Root is in (2,3)</p> $f'(x) = 3x^2 - 2$ <p>Initial root $x_0 = 2$</p> $x_i = \frac{xf'(x) - f(x)}{f'(x)}$ $= \frac{x(3x^2 - 2) - (x^3 - 2x - 5)}{3x^2 - 2}$ $= \frac{3x^3 - 2x - x^3 + 2x + 5}{3x^2 - 2}$ $= \frac{2x^3 + 5}{3x^2 - 2}$ $x_1 = 2.1$ $x_2 = 2.095$ $x_3 = 2.095$ $x_4 = 2.095$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
		<p><u>Important Note</u></p> <p><i>In the solution of the question paper, wherever possible all the possible alternative methods of solution are given for the sake of convenience. Still student may follow a method other than the given herein. In such case, first see whether the method falls within the scope of the curriculum, and then only give appropriate marks in accordance with the scheme of marking.</i></p>	