SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

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 answers 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.
8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students in first year (first and second semesters) write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.		**Solve any FIVE of the following:**	**10**
	a)	If $f(x)=\log(\sin x)$. Then find $f\left(\frac{\pi}{2}\right)$	**02**
	Ans	$f(x)=\log(\sin x)$	
		$\therefore f\left(\frac{\pi}{2}\right)=\log\left(\sin\frac{\pi}{2}\right)$	1
		$\therefore f\left(\frac{\pi}{2}\right)=0$	1
	b)	Find range of the function if $f(x)=3x^2-5x-7$ and $-3\le x<2$.	**02**
	Ans	$f(x)=3x^2-5x-7, -3\le x<2$	
		$\therefore f(-3)=3(-3)^2-5(-3)-7=35$	½
		$f(2)=3(2)^2-5(2)-7=-5$	½
		$\therefore$ Range of function $=-5\le f(x)<35$	1

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	c)	Find $\frac{dy}{dx}$, If $y=\log_{10}x+3^x$	
	Ans	$y=\log_{10}x+3^x$	
		$\therefore y=\frac{\log x}{\log 10}+3^x$	½
		$\therefore \frac{dy}{dx}=\frac{1}{\log 10}\frac{1}{x}+3^x\log 3$	1½
		$\therefore \frac{dy}{dx}=\frac{1}{x\log 10}+3^x\log 3$	
		--	
	d)	Evaluate: $\int\frac{\sin x}{\cos^2 x}\,dx$	**02**
	Ans	$\int\frac{\sin x}{\cos^2 x}\,dx=\int\frac{\sin x}{\cos x}.\frac{1}{\cos x}dx$	½
		$=\int\sec x\tan x\,dx$	½
		$=\sec x+c$	1
		OR	
		$\int\frac{\sin x}{\cos^2 x}\,dx$	
		Put $\cos x=t$	
		$\therefore \sin x dx=-dt$	½
		$\therefore \int\frac{1}{t^2}\,(-dt)$	
		$=-\left(-\frac{1}{t}\right)+c$	1
		$=\frac{1}{\cos x}+c$	
		$=\sec x+c$	½
		--	
	e)	Find the area under the curve $y=e^x$ from the ordinates $x=0$ and $x=1$.	**02**
	Ans	Area $A=\int_a^b y\,dx$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	e)	$=\int_0^1 e^x dx$	½
		$=\left[e^x\right]_0^1$	1
		$=\left(e^1-e^0\right)$	
		$=e-1$	
		or 1.718	½
	f)	Evaluate: $\int_0^{\frac{\pi}{2}} \sin x\cos x dx$	**02**
	Ans	$\int_0^{\frac{\pi}{2}} \sin x\cos x dx$	
		$=\frac{1}{2}\int_0^{\frac{\pi}{2}} \sin 2x dx$	½
		$=-\frac{1}{2}\left[\frac{\cos 2x}{2}\right]_0^{\frac{\pi}{2}}$	1
		$=-\frac{1}{2}\left[\frac{\cos\pi}{2}-\frac{\cos 0}{2}\right]$	
		$=-\frac{1}{2}\left[\frac{-1}{2}-\frac{1}{2}\right]$	
		$=\frac{1}{2}$	½
		OR	
		$\int_0^{\frac{\pi}{2}} \sin x\cos x dx$	
		Put $\sin x = t$, $\therefore \cos x dx = dt$	
		$\therefore \quad x=0,\ x=\frac{\pi}{2}$	
		$t=0,\ t=1$	½

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	f)	$\therefore \int_0^1 t\,dt$	
		$= \left[\frac{t^2}{2}\right]_0^1$	1
		$= \frac{1}{2} - 0$	
		$= \frac{1}{2}$	½
		--	
	g)	If the coin is tossed three times .Find the probability of getting exactly two heads.	**02**
	Ans	$S = \{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT\}$	
		$\therefore n(S) = 8$	½
		getting exactly two heads	
		$\therefore A = \{HHT, HTH, THH\}$	
		$\therefore n(A) = 3$	½
		$\therefore P(A) = \frac{3}{8}\; or\; 0.375$	1
		OR	
		$n = 3,\ p = \frac{1}{2}, q = \frac{1}{2}, r = 2$	
		$p(r) = nc_r\,(p)^r\,(q)^{n-r}$	
		$p(1) = 3c_2\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{3-2}$	1
		$= \frac{3}{8}\; or\; 0.375$	1
		--	
2.		**Solve any <u>THREE</u> of the following:**	**12**
	a)	If $x^2 + y^2 = 4xy$, then find $\frac{dy}{dx}$ at $(2,-1)$	**04**
	Ans	$x^2 + y^2 = 4xy$	
		$\therefore 2x + 2y\frac{dy}{dx} = 4\left(x\frac{dy}{dx} + y.1\right)$	1

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

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2.	a)	$\therefore 2x+2y\frac{dy}{dx}=4x\frac{dy}{dx}+4y$	
		$\therefore (2y-4x)\frac{dy}{dx}=4y-2x$	1
		$\therefore \frac{dy}{dx}=\frac{4y-2x}{2y-4x}$	
		$\therefore \frac{dy}{dx}=\frac{2y-x}{y-2x}$	1
		At $(2,-1)$	
		$\therefore \frac{dy}{dx}=\frac{2(-1)-2}{-1-2(2)}$	
		$\therefore \frac{dy}{dx}=\frac{4}{5}$	1
		--	
	b)	If $x=3at^2, y=2at^3$. Find $\frac{dy}{dx}$	**04**
	Ans	$x=3at^2$	
		$\therefore \frac{dx}{dt}=6at$	1
		$y=2at^3$	
		$\therefore \frac{dy}{dt}=6at^2$	1
		$\frac{dy}{dx}=\frac{\frac{dy}{dt}}{\frac{dx}{dt}}=\frac{6at^2}{6at}$	1
		$\therefore \frac{dy}{dx}=t$	1
		--	
	c)	The equation of the tangent at the point $(2, 3)$ on the curve $y=ax^3+b$ is $y=4x-5$. Find the value of $'a'$ and $'b'$.	**04**
	Ans	$y=ax^3+b$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
2.	c)	$\therefore \dfrac{dy}{dx} = 3ax^2$	1
		$\therefore$ slope $m = \dfrac{dy}{dx} = 3a(2)^2 = 12a$	½
		$\because$ the equation of tangent is $y = 4x - 5$ $\therefore$ slope $m = 4$	½
		$\therefore 12a = 4 \quad \therefore a = \dfrac{4}{12} = \dfrac{1}{3}$	1
		$\because$ the point (2, 3) is on the curve $y = ax^3 + b$ $\therefore 3 = a(2)^3 + b$	
		$\therefore b = 3 - 8a = 3 - 8\left(\dfrac{1}{3}\right) = \dfrac{1}{3}$	1
		--	
	d)	Find radius of curvature of the curve $y^2 = 4ax$ at $(a, 2a)$	**04**
	Ans	$y^2 = 4ax$	
		$\therefore 2y\dfrac{dy}{dx} = 4a$	1
		$\therefore \dfrac{dy}{dx} = \dfrac{2a}{y}$	
		$\therefore \dfrac{d^2y}{dx^2} = -\dfrac{2a}{y^2}\dfrac{dy}{dx}$	1
		$\therefore \dfrac{d^2y}{dx^2} = -\dfrac{2a}{y^2}\left(\dfrac{2a}{y}\right) = -\dfrac{4a^2}{y^3}$	
		at $(a, 2a)$	
		$\therefore \dfrac{dy}{dx} = \dfrac{2a}{2a} = 1$	½
		$\therefore \dfrac{d^2y}{dx^2} = -\dfrac{4a^2}{(2a)^3} = -\dfrac{1}{2a}$	½
		$\therefore$ Radius of curvature is $\rho = \dfrac{\left[1 + \left(\dfrac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\dfrac{d^2y}{dx^2}}$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
2.		$\therefore$ Radius of curvature is $\rho=\dfrac{\left[1+(1)^2\right]^{\frac{3}{2}}}{-\frac{1}{2a}}$	
		$\therefore \rho=-2a\left[1+(1)^2\right]^{\frac{3}{2}}$	
		$\therefore \rho=-(5.656)a$	
		$\therefore \rho=(5.656)a$	1
3.		**Solve any <u>THREE</u> of the following**	**12**
	a)	A manufacture can sell x $(x\geq 0)$ items at price is of Rs.$(330-x)$ each. The cost of producing x items in Rs. $x^2+10x+12$. How many items must be sold so that his profit is maximum.	**04**
	Ans	Let number of item be x	
		Selling price $=(330-x)x=330x-x^2$	½
		Cost price $=x^2+10x+12$	
		profit $=$ selling price $-$ cost price	
		$\therefore p=330x-x^2-\left(x^2+10x+12\right)$	
		$p=320x-2x^2-12$	½
		$\therefore \dfrac{dp}{dx}=320-4x$	1
		$\dfrac{d^2p}{dx^2}=-4$	1
		$\therefore$ profit is maximum	
		Let	
		$320-4x=0$	
		$x=80$	
		$\therefore$ 80 items must be sold so that his profit is maximum.	1

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.	b)	If $y=\tan^{-1}\left(\frac{2x}{1+15x^2}\right)$ find $\frac{dy}{dx}$	**04**
	Ans	$y=\tan^{-1}\left(\frac{5x-3x}{1+(5x)(3x)}\right)$	1
		$\therefore y=\tan^{-1}(5x)-\tan^{-1}(3x)$	1
		$\therefore \frac{dy}{dx}=\frac{1}{1+(5x)^2}(5)-\frac{1}{1+(3x)^2}(3)$	1
		$\therefore \frac{dy}{dx}=\frac{5}{1+25x^2}-\frac{3}{1+9x^2}$	1
	c)	Evaluate $\int\frac{\sin(\sqrt{x})}{\sqrt{x}}dx$	**04**
	Ans	$\int\frac{\sin(\sqrt{x})}{\sqrt{x}}dx$	
		Put $\sqrt{x}=t$	
		$\therefore \frac{1}{2\sqrt{x}}dx=dt$	
		$\therefore \frac{1}{\sqrt{x}}dx=2dt$	1
		$\therefore \int\sin t.2dt$	
		$=2\int\sin t dt$	1
		$=2(-\cos t)+c$	1
		$=-2\cos(\sqrt{x})+c$	1
	d)	Find $\frac{dy}{dx}$ if $y=(\sin x)^{\tan x}$	**04**
	Ans	$y=(\sin x)^{\tan x}$	
		$\therefore \log y=\log(\sin x)^{\tan x}$	
		$\log y=\tan x\log(\sin x)$	½

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.	d)	$\frac{1}{y}\frac{dy}{dx}=\tan x\frac{1}{\sin x}\cos x+\log(\sin x)\sec^2 x$	2
		$\frac{1}{y}\frac{dy}{dx}=\tan x\cot x+\sec^2 x\log(\sin x)$	1
		$\frac{dy}{dx}=y\left(1+\sec^2 x\log(\sin x)\right)$	
		$\frac{dy}{dx}=(\sin x)^{\tan x}\left(1+\sec^2 x\log(\sin x)\right)$	½

4.		**Solve any THREE of the following:**	**12**
	a)	Evaluate: $\int\frac{1}{\sqrt{13-6x-x^2}}\,dx$	
	Ans	$\int\frac{1}{\sqrt{13-6x-x^2}}\,dx$	
		Third term $=\frac{(-6)^2}{4}=9$	1
		$\therefore\int\frac{1}{\sqrt{13+9-9-6x-x^2}}\,dx$	1
		$=\int\frac{1}{\sqrt{22-(9+6x+x^2)}}\,dx$	
		$=\int\frac{1}{\sqrt{(\sqrt{22})^2-(x+3)^2}}\,dx$	1
		$=\sin^{-1}\left(\frac{x+3}{\sqrt{22}}\right)+c$	1
		---	
	b)	Evaluate : $\int\frac{1}{3+2\sin x}\,dx$	**04**
	Ans	$\int\frac{1}{3+2\sin x}\,dx$	
		Put $\tan\frac{x}{2}=t$, $\sin x=\frac{2t}{1+t^2}$, $dx=\frac{2dt}{1+t^2}$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
4.		$\therefore \int \frac{1}{3+2\sin x}\, dx$	
		$= \int \frac{1}{3+2\left(\frac{2t}{1+t^2}\right)} \cdot \frac{2dt}{1+t^2}$	½
		$= 2\int \frac{1}{3t^2+4t+3} dt$	½
		$= \frac{2}{3}\int \frac{1}{t^2+\frac{4}{3}t+1} dt$	
		Third term $= \frac{\left(\frac{4}{3}\right)^2}{4} = \frac{4}{9}$	½
		$= \frac{2}{3}\int \frac{1}{t^2+\frac{4}{3}t+\frac{4}{9}-\frac{4}{9}+1} dt$	½
		$= \frac{2}{3}\int \frac{1}{\left(t+\frac{2}{3}\right)^2+\left(\frac{\sqrt{5}}{3}\right)^2} dt$	½
		$= \frac{2}{3}\frac{1}{\left(\frac{\sqrt{5}}{3}\right)} \tan^{-1}\left(\frac{t+\frac{2}{3}}{\frac{\sqrt{5}}{3}}\right)+c$	1
		$= \frac{2}{\sqrt{5}} \tan^{-1}\left(\frac{3t+2}{\sqrt{5}}\right)+c$	
		$= \frac{2}{\sqrt{5}} \tan^{-1}\left(\frac{3\tan\left(\frac{x}{2}\right)+2}{\sqrt{5}}\right)+c$	½
		--	
	c)	Evalute: $\int e^x.\sin 4x dx$	**04**
	Ans	Let $\int e^x.\sin 4x dx$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

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4.	c)	$=\sin 4x\int e^{x}dx-\int\left(\int e^{x}dx\frac{d}{dx}\sin 4x\right).dx$	½
		$=\sin 4x.e^{x}-\int\cos 4x\cdot 4\cdot e^{x}dx$	½
		$=e^{x}\sin 4x-4\left[\cos 4x\int e^{x}dx-\int\left(\int e^{x}dx\cdot\frac{d}{dx}\cos 4x\right)dx\right]$	½
		$=e^{x}\sin 4x-4\left[\cos 4x\left(e^{x}\right)-\int\left(-\sin 4x\cdot 4\cdot e^{x}\right)dx\right]$	½
		$=e^{x}\sin 4x-4\left[e^{x}\cos 4x+4\int e^{x}\sin 4xdx\right]$	½
		$=e^{x}\sin 4x-4e^{x}\cos 4x-16I$	½
		$I+16I=e^{x}\sin 4x-4e^{x}\cos 4x$	
		$17I=e^{x}\sin 4xe^{x}-4e^{x}\cos 4x$	½
		$I=\frac{e^{x}}{17}\left(\sin 4x-4\cos 4x\right)+c$	½
		--	
	d)	Evaluate : $\int\frac{\log x}{x\left(2+\log\right)\left(3+\log x\right)}\,dx$	**04**
	Ans	$\int\frac{\log x}{x\left(2+\log\right)\left(3+\log x\right)}\,dx$ Put $\log x=t$ $\therefore\frac{1}{x}dx=dt$	½
		$\int\frac{t}{\left(2+t\right)\left(3+t\right)}\,dt$	
		consider $\frac{t}{\left(2+t\right)\left(3+t\right)}=\frac{A}{2+t}+\frac{B}{3+t}$	½
		$\therefore t=A\left(3+t\right)+B\left(2+t\right)$	
		Put $t=-2$	
		$A=-2$	½
		Put $t=-3$	
		$B=3$	½
		$\therefore\frac{t}{\left(2+t\right)\left(3+t\right)}=\frac{-2}{2+t}+\frac{3}{3+t}$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
4.	d)	$\therefore \int \frac{t}{(2+t)(3+t)}\,dt = \int\left(\frac{-2}{2+t}+\frac{3}{3+t}\right)dt$	½
		$=-2\log(2+t)+3\log(3+t)+c$	1
		$=-2\log(2+\log x)+3\log(3+\log x)+c$	½
		--	
	e)	Evaluate: $\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x}+\sqrt{x+4}}\,dx$	**04**
	Ans	$I=\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x}+\sqrt{x+4}}\,dx \qquad --------(1)$	
		$I=\int_0^5 \frac{\sqrt{9-(5-x)}}{\sqrt{9-(5-x)}+\sqrt{(5-x)+4}}\,dx$	1
		$\therefore I=\int_0^5 \frac{\sqrt{x+4}}{\sqrt{x+4}+\sqrt{9-x}}\,dx \qquad --------(2)$	1
		add (1) and (2)	
		$I+I=\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x}+\sqrt{x+4}}\,dx+\int_0^5 \frac{\sqrt{x+4}}{\sqrt{x+4}+\sqrt{9-x}}\,dx$	
		$\therefore 2I=\int_0^5 \frac{\sqrt{9-x}+\sqrt{x+4}}{\sqrt{9-x}+\sqrt{x+4}}\,dx$	½
		$\therefore 2I=\int_0^5 1\,dx$	
		$\therefore 2I=[x]_0^5$	1
		$\therefore 2I=5-0$	
		$\therefore 2I=5$	
		$I=\frac{5}{2}$	½
		--	
5.		**Solve any <u>TWO</u> of the following:**	**12**
	a)	Find the area bounded by the parabola $y^2=4x$ and $x^2=4y$.	**06**
	Ans	$y^2=4x \qquad ---------(1)$	

Q. No.	Sub Q. N.	Answer	Marking Scheme
5.	a)	$x^2=4y\therefore y=\frac{x^2}{4}$	
		$\therefore \text{eq}^n.(1)\Rightarrow\left(\frac{x^2}{4}\right)^2=4x$	
		$\frac{x^4}{16}=4x$	1
		$\therefore x^4=64x$	
		$\therefore x^4-64x=0$	
		$\therefore x\left(x^3-64\right)=0$	
		$\therefore x=0,4$	1
		$\text{Area } A=\int_a^b\left(y_1-y_2\right)dx$	
		$\therefore A=\int_0^4\left(2\sqrt{x}-\frac{x^2}{4}\right)dx$	
		$\therefore A=\int_0^4\left(2x^{\frac{1}{2}}-\frac{x^2}{4}\right)dx$	1
		$\therefore A=\left(\frac{2x^{\frac{3}{2}}}{\frac{3}{2}}-\frac{x^3}{12}\right)_0^4$	1
		$\therefore A=\left(\frac{2(4)^{\frac{3}{2}}}{\frac{3}{2}}-\frac{(4)^3}{12}\right)-0$	1
		$\therefore A=\frac{16}{3}$ or 5.333	1
		--	
	b) i)	Solve : $x^2y\,dx-\left(x^3+y^3\right)dy=0$ (Example is of homogeneous D.E which is out of syllabus if student attempted to solve give appropriate marks)	**03**
	Ans	$x^2y\,dx-\left(x^3+y^3\right)dy=0$	
		$\frac{dy}{dx}=\frac{x^2y}{x^3+y^3}$	

Q. No.	Sub Q. N.	Answer	Marking Scheme
5.		$y = vx$	
		$\frac{dy}{dx} = v + x\frac{dv}{dx}$	½
		$v + x\frac{dv}{dx} = \frac{x^2(vx)}{x^3 + (vx)^3}$	
		$v + x\frac{dv}{dx} = \frac{vx^3}{x^3 + v^3x^3}$	½
		$v + x\frac{dv}{dx} = \frac{v}{1+v^3}$	
		$x\frac{dv}{dx} = \frac{v}{1+v^3} - v$	
		$x\frac{dv}{dx} = \frac{v - v - v^4}{1+v^3}$	
		$x\frac{dv}{dx} = \frac{-v^4}{1+v^3}$	
		$\frac{1+v^3}{v^4}dv = -\frac{dx}{x}$	½
		solution is	
		$\int \frac{1+v^3}{v^4}dv = -\int \frac{dx}{x}$	
		$\int \left(v^{-4} + \frac{1}{v}\right)dv = -\int \frac{dx}{x}$	
		$\frac{v^{-3}}{-3} + \log v = -\log x + c$	1
		$\frac{\left(\frac{y}{x}\right)^{-3}}{-3} + \log\frac{y}{x} = -\log x + c$	½
		--	
	ii)	Form the differential equation of $y = a\cos 4x + b\sin 4x$	**03**
	Ans	$y = a\cos 4x + b\sin 4x$	

Q. No.	Sub Q. N.	Answer	Marking Scheme
5.		$\therefore \frac{dy}{dx} = -4a\sin 4x + 4b\cos 4x$	1
		$\therefore \frac{d^2y}{dx^2} = -16a\cos 4x - 16b\sin 4x$	1
		$\therefore \frac{d^2y}{dx^2} = -16\left(a\cos 4x + b\sin 4x\right)$	
		$\frac{d^2y}{dx^2} = -16y$	
		$\frac{d^2y}{dx^2} + 16y = 0$	1
	c)	Acceleration of moving particle at the end of $'t'$ second. From the start of it's motion is $\left(5-2t\right)m/s^2$.Find it's velocity at the end of 3 seconds and distance travelled by it during the period. If it's initial velocity is $4\ m/s$.	**06**
	Ans	Acceleration = $\frac{dv}{dt} = 5-2t$	
		$\therefore dv = \left(5-2t\right)dt$	
		$\therefore \int dv = \int \left(5-2t\right)dt$	
		$\therefore v = 5t - t^2 + c$	1
		$given\ v = 4$ and $t = 0$	
		$\therefore c = 4$	1
		$\therefore v = 5t - t^2 + 4$	
		$\therefore \frac{dx}{dt} = 5t - t^2 + 4$	½
		$\therefore \int dx = \int \left(5t - t^2 + 4\right)dt$	½
		$\therefore x = \frac{5t^2}{2} - \frac{t^3}{3} + 4t + c$	1
		$initially\ x = 0$ and $t = 0$	
		$\therefore c = 0$	1

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
	c)	$\therefore x=\frac{5t^2}{2}-\frac{t^3}{3}+4t$ at $t=3$ $\therefore x=\frac{5(3)^2}{2}-\frac{(3)^3}{3}+4(3)$ $\therefore x=\frac{51}{2}\ m$ or $25.5\ m$	 1
6.		**Solve any <u>TWO</u> of the following:**	**12**
	a)	If 20% of the bolt produce by a machine are defective .Find the Probability that out of 4 bolts drawn. i) one is defective ii) at the most two are defective.	**06**
	Ans	Given $p=20\%=\frac{20}{100}=0.2, n=4$ and $q=1-p=0.8$ $p(r)={}^nC_r p^r q^{n-r}$ i) $p(\text{one is defective})$ $=p(1)=4C_1(0.2)^1(0.8)^{4-1}$ $=0.4096$ ii) $p(\text{at the most two are defective.})$ $=p(0)+p(1)+p(2)$ $=4C_0(0.2)^0(0.8)^{4-0}+4C_1(0.2)^1(0.8)^{4-1}+4C_2(0.2)^2(0.8)^{4-2}$ $=0.9728$	1 1 1 1 1 1
	b)	If the probability of a bad reaction from the certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. $\left(\text{Given } e^2=7.4\right)$	**06**
	Ans	$p=0.001,\ n=2000$ $\therefore m=np=0.001\times 2000=2$	 2

Q. N.	Sub Q. N.	Answer	Marking Scheme
	Ans	$p(r)=\dfrac{e^{-m}\cdot(m)^r}{r!}$	
		more than two will get a bad reaction	
		$=1-\left(p(0)+p(1)+p(2)\right)$	
		$=1-\left(\dfrac{e^{-2}\cdot(2)^0}{0!}+\dfrac{e^{-2}\cdot(2)^1}{1!}+\dfrac{e^{-2}\cdot(2)^2}{2!}\right)$	2
		$=0.3243$	2
		--	
	c)	In a sample of 1000 cases the mean of certain test is 14 and S. D. is 2.5. Assuming the distribution to be normal,find	**06**
		i) How many students score between 12 and 15?	
		ii) How many students score above 18?	
		$\left[\text{Given: A}(0.8)=0.2881,\ \text{A}(0.4)=0.1554,\ \text{A}(1.6)=0.4452\right]$	
	Ans	Given $\bar{x}=14\quad \sigma=2.5\quad N=1000$	
		i) $z=\dfrac{x-\bar{x}}{\sigma}=\dfrac{18-14}{2.5}=1.6$	1
		$\therefore p(\text{ score above 18})=A(\text{greater than 1.6})$	
		$=0.5-A(1.6)$	
		$=0.5-0.4452\ =0.0548$	1
		$\therefore$ No.of students $=N\cdot p$	1
		$=1000\times0.0548=54.8\ \ i.e.,\ 55$	
		ii) $z=\dfrac{x-\bar{x}}{\sigma}=\dfrac{12-14}{2.5}=-0.8$	½
		$z=\dfrac{x-\bar{x}}{\sigma}=\dfrac{15-14}{2.5}=0.4$	½
		$\therefore p(\text{score between 12 and 15})=A(-0.8)+A(0.4)$	
		$=0.2881+0.1554$	1
		$=0.4435$	

SUMMER – 2022 EXAMINATION

Subject Name: Applied Mathematics **Model Answer** **Subject Code: 22206**

Q. No.	Sub Q. N.	Answer	Marking Scheme
		$\therefore \text{No. of students} = N \cdot p = 1000 \times 0.4435$ $= 443.5 \;\; i.e., \; 444$	1
		--- ***Important Note*** *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.* ---	