GOVERNMENT OF KARNATAKA
KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD

II YEAR PUC EXAMINATION MARCH 2017

SCHEME OF VALUATION

Subject Code: **35 (NS)** Subject: **Mathematics (NS)**

Instructions:

a) Answer by alternate method should be valued and suitably awarded.

b) All answers (including extra, struck off and repeated) should be valued. Answers with maximum marks awarded must be considered.

c) If the question numbers for the answers are wrong or question numbers are not written, write the correct question numbers with respect to the answers by circling it and value them.

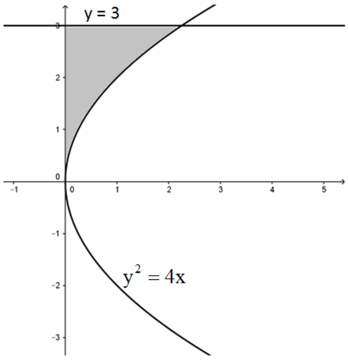
Qn No	PART A	Marks
1	LCM = 80	1
2	$-\frac{\pi}{4}$	1
3	$A=\begin{bmatrix}1 & \frac{1}{2}\\ 2 & 1\end{bmatrix}$	1
4	$\lvert AA'\rvert=\lvert A\rvert\lvert A'\rvert=8\times 8=64$	1
5	$\frac{dy}{dx}=-\sin(\sqrt{x})\frac{1}{2\sqrt{x}}$	1
6	$G.I.=\frac{2x^{3/2}}{3}+2\sqrt{x}+C$	1
7	Two vectors are collinear if they are parallel to the same line, irrespective of their magnitude and direction. ***OR*** Vectors having the same or parallel supports are known as collinear vectors. ***OR*** Vectors having same direction or opposite direction are collinear vectors ***OR*** Like vectors or Unlike vectors are collinear vectors ***OR*** Two vectors $\vec{a}$ and $\vec{b}$ are collinear vectors if $\vec{a}=\lambda\vec{b}$ for some scalar λ.	1
8	$\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}}$ ***OR*** $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$ ***OR*** $-\frac{1}{\sqrt{3}},-\frac{1}{\sqrt{3}},-\frac{1}{\sqrt{3}}$	1
9	The common region determined by all the constraints of a LPP is called feasible region of that LPP. ***OR*** The common shaded region of the given constraints in LPP is called feasible region.	1

10	$P(A\cap B)=P(A)\cdot P(B)=\frac{3}{5}\times\frac{1}{5}=\frac{3}{25}$.	1
	PART B	
11	Showing any two different elements in the domain have same image and writing f is not one-one. **OR** Let $x_1, x_2 \in R$ such that $f(x_1)=f(x_2)\Rightarrow 1+x_1^2=1+x_2^2$ $\Rightarrow x_1^2=x_2^2 \Rightarrow x_1=\pm x_2$. Writing f is not one one.	1
	Showing Range=[1, ∞)≠R(co domain) and hence f is not onto **OR** Writing Negative real numbers in the co domain do not have pre image in the domain and conclusion **OR** Giving counter example to show that f is not onto.	1
12	Taking $\cos^{-1}x=\theta$, **OR** $x=cos\theta$	1
	Getting $\sin^{-1}(2cos\theta\, sin\theta)=\sin^{-1}(\sin 2\theta)=2\theta=2\cos^{-1}x.$	1
13	Getting $\tan^{-1}(1)-\tan^{-1}x=\frac{1}{2}\tan^{-1}x$ **OR** $x=\tan\theta$ and getting $\frac{\pi}{4}-\theta=\frac{\theta}{2}$ **OR** $\tan^{-1}\left[\frac{2\left(\frac{1-x}{1+x}\right)}{1-\left(\frac{1-x}{1+x}\right)^2}\right]=\tan^{-1}x$	1
	Getting: $x=\tan\frac{\pi}{6}=\frac{1}{\sqrt{3}}$	1
14	Getting: $\frac{1}{2}\begin{vmatrix} k & 0 & 1 \\ 4 & 0 & 1 \\ 0 & 2 & 1 \end{vmatrix}=\pm 4$	1
	Writing: k=0 or 8.	1
15	Getting: $a\cdot 1+b\,2y\frac{dy}{dx}=(-\sin y)\frac{dy}{dx}$	1
	Getting: $\frac{dy}{dx}=\frac{-a}{(2by+\sin y)}$	1
16	Writing the function $y=x^2+2x-8$ is continuous in $[-4,2]$ differentiable in $(-4,2)$ **OR** $f'(x)$ = 2x +2 **OR** showing f(-4)=0=f(2).	1
	Putting $f'(c)=0$ and getting $c=-1\in(-4,2)$ **Note:** *If $c=-1\in(-4,2)$ is not written, deduct one mark.*	1
17	Writing: $V=x^3$ and $\frac{dv}{dx}=3x^2$ **OR** $\Delta V=\left(\frac{dV}{dx}\right)\Delta x$	1
	Getting approximate change in volume= $\Delta v=3x^2(0.03x)=0.09x^3$	1

18	Taking: $\tan\sqrt{x} = t$ and $\frac{sec^2\sqrt{x}}{2\sqrt{x}}\,dx = dt$	1
	Getting: $I = 2\int t^4\,dt = \frac{2}{5}\tan^5\sqrt{x} + C$	1
19	**Writing** $I = \frac{1}{9}\int_0^{\frac{2}{3}} \frac{1}{\left(\frac{4}{9}+x^2\right)}\,dx$ ***OR*** taking 3x =t and 3dx = dt, if x=0, t= 0 and x = $\frac{2}{3}$, t = 2 ***OR*** $I = \frac{1}{2} \times \frac{1}{3} \times \tan^{-1}\frac{3x}{2}\Big]_0^{\frac{2}{3}}$	1
	Getting $I = \frac{\pi}{24}$	1
20	Writing: Order is 1	1
	Writing: Degree is 2	1
21	(i) Getting PV of the point for internal division: $= \frac{-\hat{\imath}+4\hat{\jmath}+\hat{k}}{3}$ $OR \left(-\frac{1}{3}, \frac{4}{3}, \frac{1}{3}\right)$	1
	(ii) Getting P.V. of the point for external division : $= -3\,\hat{\imath} + 3\,\hat{k}$ OR $(-3, 0, 3)$	1
22	Getting $\vec{a} \times \vec{b} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & -1 & 3 \\ 2 & -7 & 1 \end{vmatrix} = 20\hat{\imath} + 5\hat{\jmath} - 5\hat{k}$ OR (20, 5, -5)	1
	Getting the area of a parallelogram is $\lvert\vec{a} \times \vec{b}\rvert = \sqrt{450}$ ***OR*** $= 15\sqrt{2}$	1
23	Getting vector equation of a line $\overrightarrow{AB}$ as $\vec{r} = \vec{a} + \lambda(\vec{b} - \vec{a}) = 3\hat{\imath} - 2\hat{\jmath} - 5\hat{k} + \lambda(11\,\hat{k})$	1
	Getting Cartesian equation of the line: $\frac{x-3}{0} = \frac{y+2}{0} = \frac{z+5}{11}$.	1
24	Let X : number of heads in two tosses of a coin. Writing $X = 0, 1, 2$ ***OR*** Getting $P(X = 0) = P(\text{tail occurs on both tosses i.e no head}) = \frac{1}{4}$ ***OR*** $P(X = 1) = P(\text{one head and one tail occurs}) = \frac{1}{2}$ ***OR*** $P(X = 2) = P(\text{head occurs on both tosses}) = \frac{1}{4}$	1
	All $P(X = 0)$, $P(X = 1)$ and $P(X = 2)$ are correct.	1

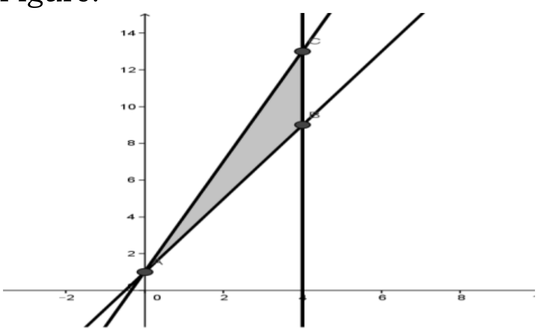
	OR	
	Writing the probability distribution as X: 0, 1, 2 P(X): $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$	2
	PART C	
25	Showing R as reflexive: $a \le a \ \forall a \in R \Rightarrow (a,a) \in R$	1
	Showing R is not symmetric by giving any counter example: as $(1,2) \in R\, but\ (2,1) \notin R \Rightarrow R$ is not symmetric.	1
	Showing R is transitive: (a, b) and (b, c) $\epsilon R \ \Rightarrow a \le b \ and\ b \le c$ $\Rightarrow a \le c \ so\ (a,c) \in R$	1
26	Taking $x = tan\theta$ **OR** $\tan^{-1} x = \theta$	1
	Getting: $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) = \tan^{-1}\left(\frac{\frac{1}{\cos\theta}-1}{\frac{\sin\theta}{\cos\theta}}\right) = \tan^{-1}\left(\frac{1-\cos\theta}{sin\theta}\right)$	1
	Getting: $\tan^{-1}\left(\tan\frac{\theta}{2}\right) = \frac{\theta}{2} = \frac{1}{2}\tan^{-1}x$	1
27	Writing: $A' = A\, and\ B' = B$	1
	Let AB be symmetric, then $(AB)' = AB \Longrightarrow B'A' = AB$, Showing $BA = AB$	1
	Writing conversely, if $AB = BA$, then $(AB)' = B'A' = BA = AB$ and conclusion.	1
28	Writing: $\log y = \cos x \cdot \log(\log x)$	1
	Getting: $\frac{1}{y}\frac{dy}{dx} = \left[\cos x \frac{1}{(\log x)} \times \frac{1}{x} + \log(\log x)(-\sin x)\right]$	1
	Getting: $\frac{dy}{dx} = (\log x)^{\cos x}\left[\frac{\cos x}{x\log x} - (\sin x)\log(\log x)\right]$. **OR** $\frac{dy}{dx} = y\left[\frac{\cos x}{x\log x} - (\sin x)\log(\log x)\right]$.	1
29	Getting: $\frac{du}{dx} = 2\sin x \cos x$	1
	Getting: $\frac{dv}{dx} = e^{\cos x}(-\sin x)$	1

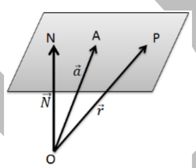
	Getting: $\frac{du}{dv}=\frac{2\sin x\cos x}{e^{\cos x}(-\sin x)}=-\frac{2\cos x}{e^{\cos x}}$.	1
30	Writing: $P=xy^3$ and $P=(60-y)y^3$ **OR** $P=x(60-x)^3$	1
	Getting: $\frac{dP}{dy}=60\times 3y^2-4y^3$ **OR** $\frac{dP}{dx}=-3x(60-x)^2+(60-x)^3$	1
	Getting x=15 and y=45	1
31	$\frac{2x}{x^2+3x+2}=\frac{2x}{(x+2)(x+1)}=\frac{A}{x+2}+\frac{B}{x+1}$ **OR** $\frac{2x}{x^2+3x+2}=\frac{2x}{(x+2)(x+1)}=\frac{4}{x+2}+\frac{-2}{x+1}$ **OR** $\frac{2x}{x^2+3x+2}=\frac{(2x+3)-3}{x^2+3x+2}$	1
	$I=\int\left(\frac{4}{x+2}-\frac{2}{x+1}\right)dx$ **OR** $I=\int\frac{2x+3}{x^2+3x+2}dx-\int\frac{3}{x^2+3x+2}dx$	1
	Getting: $4\log\|x+2\|-2\log\|x+1\|+C$ **OR** $\log(x^2+3x+2)-3\log\left(\frac{x+1}{x+2}\right)+C$	1
32	Writing: $I=\int e^x\sin x\,dx$ and getting: $I=e^x(-\cos x)-\int e^x(-\cos x)\,dx$	1
	Getting: $I=-e^x\cos x+e^x\sin x-\int e^x\sin x\,dx$	1
	Getting: $I=\frac{e^x}{2}(\sin x-\cos x)+C$	1
33	Writing required area : $A=\int_0^3 x\,dy$	1
	Getting: $A=\frac{1}{4}\left[\frac{y^3}{3}\right]_0^3$	1
	Getting: $A=\frac{27}{12}$ OR $\frac{9}{4}$	1
	OR	

	Drawing the figure  	1
	Area of the region: $A = \int_0^3 x\,dy = \int_0^3 \frac{y^2}{4} dy$	1
	Getting: A = $\frac{27}{12}$ OR $\frac{9}{4}$	1
34	Getting: $x^2 + (y-k)^2 = 3^2$	1
	Getting: $2x + 2(y-k)\frac{dy}{dx} = 0$	1
	Substituting and getting the differential equation: $x^2 + \left(-\frac{x}{\frac{dy}{dx}}\right)^2 = 9$ ***OR*** $2x + 2\sqrt{9-x^2}\,\frac{dy}{dx} = 0$	1
35	$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} \equiv (1,\ x-2,\ 4)$, $\overrightarrow{AC} = \overrightarrow{OC} - \overrightarrow{OA} \equiv (1, 0, -3)$ and $\overrightarrow{AD} = \overrightarrow{OD} - \overrightarrow{OA} \equiv (3,\ 3,\ -2)$	1
	Writing $\begin{vmatrix} 1 & x-2 & 4 \\ 1 & 0 & -3 \\ 3 & 3 & -2 \end{vmatrix} = 0$	1
	Getting: $x = 5.$	1
36	Writing: $\lvert\vec{a}+\vec{b}+\vec{c}\rvert^2 = \lvert\vec{a}\rvert^2 + \lvert\vec{b}\rvert^2 + \lvert\vec{c}\rvert^2 + 2(\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a})$	1
	$0 = 1 + 16 + 4 + 2\mu$	1
	$\mu = -\frac{21}{2}$	1
37	Here $\vec{a}_1 = \hat{i} + 2j + k,\ \vec{b}_1 = \hat{i} - j + k$ $\vec{a}_2 = 2\hat{i} - j - k,\ \vec{b}_2 = 2\hat{i} + j + 2k$ ***OR*** $\vec{a}_2 - \vec{a}_1 = \hat{i} - 3j - 2k$ OR $(1, -3, -2)$	1

	$\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & j & k \\ 1 & -1 & 1 \\ 2 & 1 & 2 \end{vmatrix} = -3\hat{i} + 3k$ =(-3, 0, 3) **OR** Writing the formula for shortest distance $d = \frac{\lvert(\vec{b}_1 \times \vec{b}_2)\cdot(\vec{a}_2 - \vec{a}_1)\rvert}{\lvert\vec{b}_1 \times \vec{b}_2\rvert}$	1
	Getting: $d = \frac{9}{\sqrt{18}}$ OR $\frac{9}{3\sqrt{2}}$ OR $\frac{3}{\sqrt{2}}$.	1
38	Writing: $E = \{(1,3),(2,2),(3,1)\}$ **OR** Getting $P(E) = \frac{3}{36} = \frac{1}{12}$	1
	Taking F: numbers appearing on two dice are different. $\therefore n(F) = 30 \Rightarrow P(F) = \frac{30}{36} = \frac{5}{6}$ **OR** $E \cap F = \{(1,3),(3,1)\} \Rightarrow P(E \cap F) = \frac{2}{36} = \frac{1}{18}$	1
	Getting Required probability $P(E\mid F) = \frac{1}{15}$.	1
	PART D	
39	Defining $g: S \to N$, $g(y) = \frac{\sqrt{y-6} - 3}{2}$, **OR** Defining $g: S \to N$, $g(x) = \frac{\sqrt{x-6} - 3}{2}$, **OR** Writing $y = 4x^2 + 12x + 15 \Rightarrow x = \frac{\sqrt{y-6} - 3}{2}$.	1
	Showing $g o f(x) = x$.	1
	Getting $f o g(y) = y$, **OR** $f o g(x) = x$.	1
	Stating $g o f = I_N$ and $f o g = I_S$ and conclusion	1
	Writing $f^{-1}(x) = \frac{\sqrt{x-6} - 3}{2}$ **OR** $f^{-1} = g$	1
	OR	
	Let $x_1, x_2 \in N$ be such that $f(x_1) = f(x_2)$	1
	Getting $x_1 = x_2$. Therefore f is one-one.	1
	Let $y \in S$ then $y = 4x^2 + 12x + 15 = f(x) \Rightarrow x = \frac{\sqrt{y-6} - 3}{2} \in N$ **OR** Stating: Every element of S is the image of the element of N	1
	Proving Onto: $\forall y \in S, \frac{\sqrt{y-6} - 3}{2} \in N$ such that $f\left(\frac{\sqrt{y-6} - 3}{2}\right) = y$. **OR** Writing: f(N)=S or Range is the codomain, hence f is onto.	1

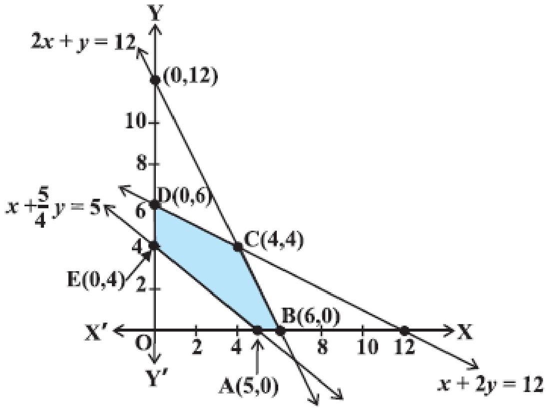
	Writing: $f^{-1}(x)=\frac{\sqrt{x-6}-3}{2}$.	1
40	Finding: $A^2=\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}=\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}$	1
	Finding: $A^3=\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}=\begin{bmatrix}21&0&34\\12&8&23\\34&0&55\end{bmatrix}$	1
	Writing: $A^3-6A^2+7A+2I$ $=\begin{bmatrix}21&0&34\\12&8&23\\34&0&55\end{bmatrix}-6\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}+7\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}+2\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$	1
	Writing: LHS $=\begin{bmatrix}21&0&34\\12&8&23\\34&0&55\end{bmatrix}+\begin{bmatrix}-30&0&-48\\-12&-24&-30\\-48&0&-78\end{bmatrix}+\begin{bmatrix}7&0&14\\0&14&7\\14&0&21\end{bmatrix}+\begin{bmatrix}2&0&0\\0&2&0\\0&0&2\end{bmatrix}$	1
	Getting LHS $=\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}=O=RHS$	1
41	Let $A=\begin{bmatrix}1&-1&2\\0&2&-3\\3&-2&4\end{bmatrix}$, $X=\begin{bmatrix}x\\y\\z\end{bmatrix}$ and $B=\begin{bmatrix}1\\1\\2\end{bmatrix}$ ***OR***	1
	Writing: $X=A^{-1}B=\frac{1}{\lvert A\rvert}(\text{adj}A)B$ ***OR*** $X=\frac{1}{\lvert A\rvert}(\text{adj}A)B$	
	Getting: $\therefore adjA=\begin{bmatrix}2&0&-1\\-9&-2&3\\-6&-1&2\end{bmatrix}$ ***Note:*** *If any 4 cofactors are correct award 1 mark.*	2
	Getting: $\lvert A\rvert=1(8-6)+1(0+9)+2(0-6)$ = 2 +9 – 12 = -1	1
	Getting x= 0, y= 5, z = 3.	1
42	Getting: $\frac{dy}{dx}$ *OR* $y_1=2\tan^{-1}x\cdot\frac{1}{1+x^2}$	1
	Writing: $(1+x^2)y_1=2\tan^{-1}x$ or $(1+x^2)\frac{dy}{dx}=2\tan^{-1}x$	1

	Getting $\left(1+x^2\right)y_2+y_1(0+2x)=2\times\frac{1}{1+x^2}$ or $(1+x^2)\frac{d^2y}{dx^2}+2x\frac{dy}{dx}=\frac{2}{1+x^2}$	2
	Getting $\left(1+x^2\right)^2y_2+2x\left(1+x^2\right)y_1=2.$ ***OR*** $(1+x^2)^2\frac{d^2y}{dx^2}+2x(1+x^2)\frac{dy}{dx}=2$	1
43	$P=2(x+y)$ OR $A=xy$	1
	Writing: $\frac{dx}{dt}=-5\,cm/\min$ and $\frac{dy}{dt}=4\,cm/\min$	1
	Getting: $\frac{dP}{dt}=2\left(\frac{dx}{dt}+\frac{dy}{dt}\right)$	1
	Getting: $\frac{dA}{dt}=x\frac{dy}{dt}+y\frac{dx}{dt}$	1
	Getting: $\frac{dP}{dt}=-2\,cm/\min$ *and* $\frac{dA}{dt}=2cm^2/\min$	1
44	Getting: $I=\int\sqrt{x^2-a^2}\,dx=\sqrt{x^2-a^2}\cdot x-\int\frac{1}{2}\left(x^2-a^2\right)^{\frac{1}{2}-1}(2x-0)\,x\,dx$	1
	Getting: $I=x\sqrt{x^2-a^2}-\int\sqrt{x^2-a^2}\,dx-a^2\int\frac{1}{\sqrt{x^2-a^2}}dx$	1
	Getting: $I=\frac{x\sqrt{x^2-a^2}}{2}-\frac{a^2}{2}\log\left\|x+\sqrt{x^2-a^2}\right\|+C$	1
	Getting: $I=\int\sqrt{(x-4)^2-3^2}\,dx$	1
	Getting: $I=\frac{x-4}{2}\sqrt{(x-4)^2-3^2}-\frac{9}{2}\log\left\|(x-4)+\sqrt{(x-4)^2-3^2}\right\|+C$	1
45	Getting vertices of triangle as A(0,1), B(4,13) and C(4,9).	1
	Figure: 	1

	Area $=\int_0^4 (3x+1)\,dx-\int_0^4 (2x+1)\,dx$	1
	Area $=\left[\frac{3x^2}{2}+x\right]_0^4-\left[\frac{2x^2}{2}+x\right]_0^4$	1
	Getting: Area $=8$	1
46	Getting: $\frac{dy}{dx}+\frac{y}{\cos^2 x}=\frac{\tan x}{\cos^2 x}$ **OR** $\frac{dy}{dx}+(\sec^2 x)y=\tan x\sec^2 x$	1
	Getting: I F = $=e^{\int p\,dx}=e^{\int \sec^2 x\,dx}=e^{\tan x}$	1
	Writing general solution $y\,e^{\tan x}=\int \tan x\cdot\sec^2 x\,e^{\tan x}\,dx+C$	1
	Getting: $y e^{\tan x}=t\cdot e^t-\int 1\cdot e^t\,dt+C$ $\left(by\,taking\ \tan x=t\Rightarrow \sec^2 x\,dx=dt\right)$	1
	Getting: $y\,e^{\tan x}=\tan x\cdot e^{\tan x}-e^{\tan x}+C$.	1
47	Drawing any appropriate figure 	1
	Writing $\overrightarrow{AP}\cdot\overrightarrow{ON}=0$	1
	Getting vector form $(\vec{r}-\vec{a})\cdot\vec{N}=0$	1
	Writing $\overrightarrow{OA}=\vec{a}=x_1\hat{i}+y_1\hat{j}+z_1\hat{k}$, $\overrightarrow{OP}=\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, $\therefore \vec{N}=A\hat{i}+B\hat{j}+C\hat{k}$	1
	Writing Cartesian form $(x-x_1)A+(y-y_1)B+(z-z_1)C=0$. **Note: Figure is compulsory.**	1
48	Writing $n=5, p=0.05$	1
	Writing $P(X=x)={}^nC_x\,q^{n-x}\cdot p^x={}^5C_x(0\cdot95)^{5-x}\cdot(0\cdot05)^x$	1
	Getting $P(X=0)={}^5C_0\,(0.95)^{5-0}\cdot(0.05)^0=(0\cdot95)^5$	1
	Getting $P(x\le 1)=P(0)+P(1)$ $=(0\cdot95)^5+{}^5C_1(0\cdot95)^4(0\cdot05)^1$ **OR** $(0\cdot95)^4(1\cdot20)$	1

	Getting $P(x>1)=1-P(x\le 1)=1-\left[(0\cdot 95)^5+{}^5C_1(0\cdot 95)^4(0\cdot 05)^1\right]$ OR $1-(0\cdot 95)^4(1\cdot 20)$	1
PART E		
49 a	Putting $x=a-t$, then $dx=-dt$. Also $x=0 \implies t=a$ and $x=a \implies t=0$	1
	Getting: LHS $=\int_a^0 f(a-t)\,(-dt)=\int_0^a f(a-t)dt$	1
	Getting: $\text{LHS}=\int_0^a f(a-t)dt=\int_0^a f(a-x)dx=\text{RHS}$	1
	Writing: $I=2\int_0^{\pi/2}\log\sin x\,dx-\int_0^{\pi/2}\log(2\sin x\cos x)\,dx$ **OR** $I=\int_0^{\pi/2}\log\frac{\tan x}{2}\,dx$	1
	Writing: $I=2\int_0^{\pi/2}\log\sin x\,dx-\int_0^{\pi/2}\log 2\,dx-\int_0^{\pi/2}\log\sin x\,dx-\int_0^{\pi/2}\log\cos x\,dx$ $=\int_0^{\pi/2}\log\sin x\,dx-\int_0^{\pi/2}\log\cos\left(\frac{\pi}{2}-x\right)dx-(\log 2)\frac{\pi}{2}$ **OR** $I=\int_0^{\pi/2}\log\frac{\cot x}{2}\,dx$	1
	Getting: I = $=-\frac{\pi}{2}\log 2$ *OR* $\frac{\pi}{2}\log\frac{1}{2}$	1
49 b	Writing : $\Delta=\frac{1}{xyz}\begin{vmatrix}x^2 & x^3 & xyz\\ y^2 & y^3 & xyz\\ z^2 & z^3 & xyz\end{vmatrix}$ **OR** Applying $R_1\to R_1-R_2$ and $R_2\to R_2-R_3$, $=\begin{vmatrix}x-y & x^2-y^2 & yz-zx\\ y-z & y^2-z^2 & zx-xy\\ z & z^2 & xy\end{vmatrix}$	1
	Getting $\Delta=\begin{vmatrix}x^2 & x^3 & 1\\ y^2 & y^3 & 1\\ z^2 & z^3 & 1\end{vmatrix}$ **OR** $\Delta=(x-y)(y-z)\begin{vmatrix}1 & (x+y) & -z\\ 1 & (y+z) & -x\\ z & z^2 & xy\end{vmatrix}$	1
	Getting $\Delta=\begin{vmatrix}x^2 & x^3 & 1\\ y^2-x^2 & y^3-x^3 & 0\\ z^2-x^2 & z^3-x^3 & 0\end{vmatrix}$ **OR** Applying $R_2\to R_2-R_1$, getting $\Delta=(x-y)(y-z)\begin{vmatrix}1 & (x+y) & -z\\ 0 & z-x & z-x\\ z & z^2 & xy\end{vmatrix}$	1

	getting $\Delta = (x-y)(y-z)(z-x)(xy+yz+zx)$	1
50 a	Graph Representation of all the three lines carries 1 mark and shading feasible region carries 1 mark.	2



	Writing corner points A(5, 0),B (6, 0),C(4, 4),D(0, 6)and E(0, 4)	1
	Getting: optimal values	1

Sl. No.	Corner point	Value of $Z = 600x + 400y$
1.	E(0, 4)	1600← Minimum
2.	D(0, 6)	2400
3.	C(4, 4)	4000 ← Maximum
4.	B (6, 0)	3600
5.	A(5, 0)	3000

	Getting: $\therefore$ Minimum value of $Z = 600\times 0 + 400\times 4 = 1600$ at the point $(0,4)$ ***OR*** Indicating Minimum value in the table.	1
	Getting: Maximum value of $Z = 600\times 4 + 400\times 4 = 4000$ at the points $(4,4)$ ***OR*** Indicating maximum value in the table.	1
50 b	Stating: $f\left(\frac{\pi}{2}\right) = \lim_{x\to\frac{\pi}{2}}\left(\frac{k\cos x}{\pi - 2x}\right)$	1
	Taking: $\pi - 2x = \theta$ and stating $\theta \to 0$ ***OR*** Taking: $x = \frac{\pi}{2} - \theta$ and stating $\theta \to 0$ ***OR*** Taking: $\frac{\pi}{2} + h = x$ and stating $h \to 0$	1
	Getting: $3 = \lim_{\theta\to 0}\frac{k\cos\left(\frac{\pi}{2} - \frac{\theta}{2}\right)}{\theta} = \lim_{\theta\to 0}\frac{k\sin\left(\frac{\theta}{2}\right)}{\theta}$	1

	OR $3=\lim_{\theta\to 0}\frac{\text{k}\cos\left(\frac{\pi}{2}-\theta\right)}{2\theta}=\lim_{\theta\to 0}\frac{\text{k}\sin(\theta)}{2\theta}$ **OR** $3=\lim_{h\to 0}\frac{k\cos\left(\frac{\pi}{2}+h\right)}{\pi-2\left(\frac{\pi}{2}+h\right)}=\lim_{h\to 0}\frac{k(-\sinh)}{-2h}$	
	Obtaining:k = 6	1