GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESMENT BOARD
II YEAR PUC SUPPLEMENTARY EXAMINATION MAY/JUNE 2023
SCHEME OF EVALUATION.

Subject Code: 35 Subject:Mathematics

Instructions:

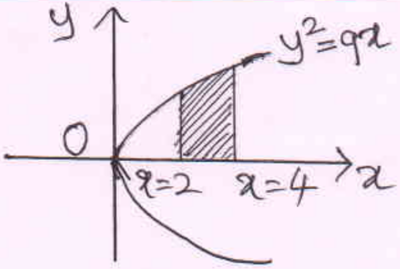
a) Any answer by alternate method should be valued and suitably awarded.
b) All answers (including extra stuck off and repeated) should be valued. Answers with maximum marks must be considered.

Q.No.	PART A	Marks
1	c) or writing 2	1
2.	a) or $(-^{\pi}/_{2}, ^{\pi}/_{2})$	1
3.	b) or writing 2	1
4.	d) or writing $\pm 2\sqrt{2}$	1
5.	a) Or writing -1	1
6.	b) Or writing, e^x Sinx +C	1
7.	d) Or writing 1	1
8.	a) Or writing $\pi-\alpha, \quad \pi-\beta, \quad \pi-r$	1
9.	c) Or writing Linear function	1
10.	b) Or Not defined	1
	II	
11.	5	1
12.	1	1
13.	9	1
14.	11	1
15.	¼	1
	III	
16.	A Function f:X→ Y is said to be an injective function if the images of distict elements of 'X' under 'f' are distinct OR	1

	For every , x_1 , $x_2 \in X$ such that f(x_1) =$f(x_2)$ impels x_1 =x_2	
17.	Writing $\frac{dy}{dx}$=Sec^2 (2x+3)2 OR writing f$^1(x)$= Sec^2(2x+3)2.	1
18.	Optimal Solution is any point in the feasible region that gives the optimal value (Maximum or Minimum) of the objective functions is called optimal solution	1
19.	$\frac{x^3}{3}$ -X+C	1
20	Unit vector = $\hat{a} = \frac{2}{\sqrt{14}}\hat{\imath} + \frac{3}{\sqrt{14}}\hat{\jmath} + \frac{1}{\sqrt{14}}\hat{k}$	1
	PART-B	
21	Getting fog (x) = f(g(x)) = f($x^{1/3}$) = 8 $\left[x^{1/3}\right]^3$ =8x	1
	Getting gof(x) = g(f(x) = g($8x^3$) =$(8x^3)^{1/3}$ = 2x	1
22	Writing $sin^{-1}\left[\frac{1}{x}\right] = \theta$ and $Sin\theta = \frac{1}{x}$ taking reciprocal Cosecθ =x	1
	Writing θ =cos ec^{-1}x and sin$^{-1}\frac{1}{x}$ =cos ec^{-1}x	1
23	Writing $tan^{-1}\sqrt{\frac{2sin^2\frac{x}{2}}{2cos^2\frac{x}{2}}}$	1
	Getting tan^{-1}($tan\ ^{x}/_{2}$) $= \frac{x}{2}$	1
24	Writing Area =$\frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$ Or Area =$\frac{1}{2}\begin{vmatrix} -2 & -3 & 1 \\ 3 & 2 & 1 \\ -1 & -8 & 1 \end{vmatrix}$	1
	Getting Area =15	1
25	Getting a + 2by $\frac{dy}{dx}$ = - siny $\frac{dy}{dx}$	1
	Getting $\frac{dy}{dx} = \frac{-a}{(2by+siny)}$	1
26	Writing y=$(log_e x)^x$ and log_ey =x. log_e(logx)	1

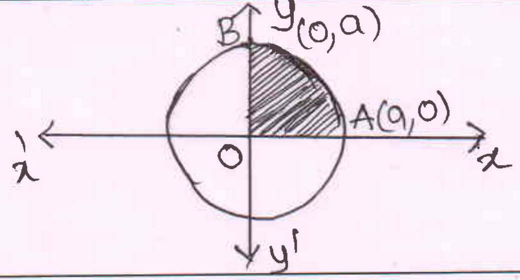
	Getting $\frac{dy}{dx} = y\left[\frac{1}{log_{ex}} + log_e(log_e x)\right]$ OR $\frac{dy}{dx} = (log_e\, x)^x \left[\frac{1}{log_{ex}} + log_e\, (log_e x\,)\right]$	1
27.	f^1 (x) = 0 and getting x = ± 1	1
	Getting local maximum value f(1) =2	1
28.	Getting, $-\frac{1}{2}\ \int(Cos12x - Cos4x)dx$	1
	Getting - $\frac{1}{24}$ Sin 12x + $\frac{1}{8}$ Sin 4x +c	1
29.	Getting, $\int_0^{\pi/4} tanx\ \ dx = [\log Secx]_{o}^{\pi/4}$	1
	Getting, log$\sqrt{2}$ - log 1 = log$\sqrt{2}$	1
30.	Getting $\frac{dy}{dx}$ =m	1
	Getting $\frac{dy}{dx} = {}^{y}/_{x}$ or $x\frac{dy}{dx}$ =y	1
31	Taking $\vec{a} = +\hat{i} + 3\hat{j} + 7\hat{k}$ and $\vec{b} = 7\hat{I} - \hat{J} + 8\hat{K}$ Getting $\vec{a}.\vec{b}$ =60 and $\vert\vec{b}\vert = \sqrt{114}$	1
	Getting projection of $\vec{a}$ on $\vec{b} = \frac{60}{\sqrt{114}}$	1
32.	Getting $\vec{a}\, x\vec{b} = 5\hat{I} + \hat{J} - 4\hat{k}$	1
	Getting Area the parallelogram = $\sqrt{42}$ squnits	1
33.	Getting $\vec{n_1}.\vec{n_2}$ = - 15 and $\vert\vec{n_1}\vert = \sqrt{17}$, $\vert\vec{n_2}\vert = \sqrt{43}$ OR writing Cosθ = $\left\vert\frac{\vec{n}_1.\vec{n}_2}{\vert\vec{n_1}\vert\,\vert\vec{n}_2\vert}\right\vert$	1

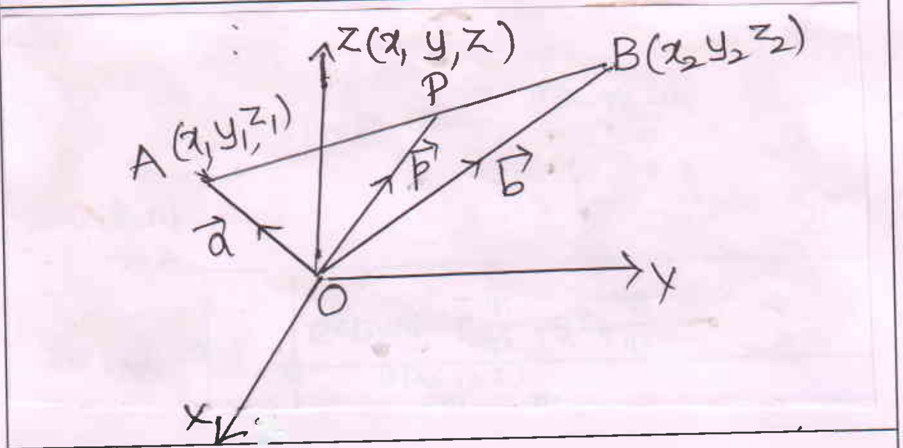
	Getting $\theta = \cos^{-1}\frac{15}{\sqrt{731}}$	1
34	Writing 0.1 + k + 2k + 2k + K =1	1
	Getting 6k= 0 . 9 And k = 0.15	1
	PART -C	
35	Showing Reflexive	1
	Showing Symmetric	1
	Showing transitive	1
36.	Writing $\tan^{-1}2x + \tan^{-1}3x = \tan^{-1}\left(\frac{2x+3x}{1-6x^2}\right) = \frac{\pi}{4}$	1
	Getting $\frac{5x}{1-6x^2}$ =1	1
	Getting x=$^1/_6$ or $x = -1$ Writing x =$^1/_6$ is the only solution	1
37	Writing $A^{|}$ = $\begin{pmatrix} 1 & -1 \\ 5 & 2 \end{pmatrix}$	1
	Getting P =$\frac{1}{2}(A + A^1)$ = $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$	1
	Getting, Q=$\frac{1}{2}$ $(A - A^1)$ = $\begin{pmatrix} 0 & 3 \\ -3 & 0 \end{pmatrix}$ and getting P + Q = $\begin{pmatrix} 1 & 5 \\ -1 & 2 \end{pmatrix}$ =A	1
38	Writing $\frac{dx}{d\theta}$ = a (1- Cos θ)	1
	Writing $\frac{dy}{d\theta}$ = - a sinθ	1

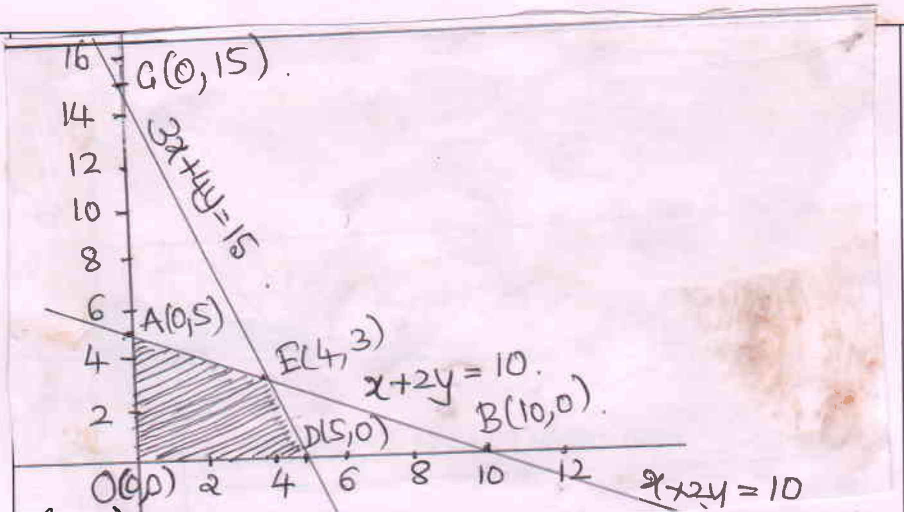
	Getting $\frac{dy}{dx} = \frac{-a\sin\theta}{a(1-Cos\theta)}$ OR Getting $\frac{dy}{dx}$ = - Cot $\left(\theta/2\right)$	1
39	Writing ' f ' is continous in [-4, 2] and ' f' is differntiable in (-4, 2)	1
	Getting $f^{\vert}(x) = 2x + 2$ Or getting f(-4) = 0, f(2) = 0	1
	Writing C= -1 ∈ (-4, 2)	1
40	Writing $f^{\vert}(x)$ = 2x-4 OR getting x= 2	1
	Writing ' f ' is strictly increasing in (2, ∞)	1
	Writing ' f ' is strictly decreasing in (- ∞, 2)	1
41	Writing I = x $\int sec^2 xdx$ - $\int [\int sec^2 xdx.\frac{d}{dx}(x)]$ dx	1
	Getting I = x tanx - $\int tanxdx$	1
	Getting I = xtanx – log |secx| +c	1
42.	Writing $\frac{1}{(x+1)(x+2)} = \frac{A}{x+1} + \frac{B}{x+2}$	1
	Getting A = 1 and B -1	1
	Getting I =log |x+1| – log |x+2| +c OR I= log $\left\vert \frac{x+1}{x+2} \right\vert$+c	1
43	 OR writing Area, A = $\int_2^4 3\sqrt{xdx}$	1
	Writing Area, A = 3 $(\frac{2}{3})$ $[x^{3/2}]_2^4$	1
	Getting A = $^8/_3$ (4 - $\sqrt{2}$) square units	1

44	Writing $\frac{dy}{1+y^2} = (1+x^2)dx$	1
	Writing $\int \frac{dy}{1+y^2} = \int (1+x^2)dx$	1
	Getting $\tan^{-1}y = x + \frac{x^3}{3}+c$	1
45	Writing $(\vec{a} + \lambda \vec{b}).\ \vec{c} = 0$	1
	Getting $[\ \hat{i}\ (2-\lambda) + \hat{j}\ (2+2\lambda) + \hat{k}\ (3+\lambda)\ ].\ (3\hat{i}+\hat{j}) = 0$	1
	Getting $-\lambda + 8 = 0$ and writing $\lambda = 8$	1
46	Getting $[\vec{a}\ \vec{b}\ \vec{c}]$ or $\vec{a}.\ (\vec{b} \times \vec{c}) = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & -4 \\ 1 & -3 & 5 \end{vmatrix}$	1
	Getting $[\vec{a}\ \vec{b}\ \vec{c}] = 0$	1
	Writing the given vectors are coplanar	1
47	Writing $\vec{a} = \hat{i} - 2\hat{K}$, and $\vec{N} = \hat{i} + \hat{j} - \hat{K}$	1
	Writing , $1\ (x-1) + 1\ (y-0) - 1\ (z+2) = 0$	1
	Getting $x + y - z - 3 = 0$	1
48	Writing, $P(E_1) = ½$, $P(E_2) = ½$, $P(A/E_1) = \frac{3}{7}$, $P(A/E_2) = \frac{5}{11}$	1
	Writing $P(E_2/A) = \frac{P(E_2)\ \ P(A/E_2)}{P(E_1)\ \ P(A/E_1) + P(E_2)\ \ P(A/E_2)}$	1
	Getting $P(E_2/A) = \frac{35}{68}$	1

	PART D	
49	Writing f(x)=y = 4x + 3 and getting g(y) = $\left(\frac{y-3}{4}\right)$	1
	Showing fog (y) = y	1
	Showing gof (x) = x	1
	Writing fog = I_y and gof = I_N and concluding 'f' is invertible or f^{1} exists.	1
	Getting $f^{1}(X) = \left(\frac{x-3}{4}\right)$ or writing 'g' is the inverse of 'f'	1
	OR	1
	Proving $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$	1
	Hence f is one – one	1
	Writing $x = \frac{y-3}{4}$	1
	∀y∈Y there exist x∈N such that f(x)=y hence f is onto OR proving f $\left(\frac{y-3}{4}\right) = y$	1
	writing f is invertible and getting $f^{-1}(x) = \frac{x-3}{4}$	1
50	Getting A+B = $\begin{bmatrix} 4 & 1 & -1 \\ 9 & 2 & 7 \\ 3 & -1 & 4 \end{bmatrix}$	1
	Getting B-C = $\begin{bmatrix} -1 & -2 & 0 \\ 4 & -1 & 3 \\ 1 & 2 & 0 \end{bmatrix}$	1
	Getting (A+B) - C = $\begin{bmatrix} 0 & 0 & -3 \\ 9 & -1 & 5 \\ 2 & 1 & 1 \end{bmatrix}$	1
	Getting A + (B – C) = $\begin{bmatrix} 0 & 0 & -3 \\ 9 & -1 & 5 \\ 2 & 1 & 1 \end{bmatrix}$	1
	Writing (A+B) – C = A + (B – C)	1
51	Writing A = $\begin{bmatrix} 2 & 3 & 3 \\ 1 & -2 & 1 \\ 3 & -1 & -2 \end{bmatrix}$ X = $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ and B = $\begin{pmatrix} 5 \\ -4 \\ 3 \end{pmatrix}$ OR Getting $\lvert A\rvert = 40 \neq 0$ Note Award a mark, if student directly writes $\lvert A\rvert=40$	1
	Getting adj A = $\begin{pmatrix} 5 & 3 & 9 \\ 5 & -13 & 1 \\ 5 & 11 & -7 \end{pmatrix}$ Note : if any 4 cofactors are correct award 1 mark	2

	Writing x = A^{-1}B = $\frac{1}{\lvert A\rvert}$(adjA) B OR x = $\frac{1}{40}\begin{pmatrix} 5 & 3 & 9 \\ 5 & -13 & 1 \\ 5 & 11 & -7 \end{pmatrix}\begin{bmatrix} 5 \\ -4 \\ 3 \end{bmatrix}$	1
	Geeting x =1, y=2 and z=-1	1
52	Getting y_1, = $\frac{2tan^{-1}x}{1+x^2}$	1
	Getting $(1 + x^2)$ y_1 = 2tan^{-1}x	1
	Getting (1 + x^2) y_2 + y_1(2x) =2 $\frac{1}{1+x^2}$	2
	Writing (1 + x^2) y_2 + 2x(1+x^2)y_1 = 2	1
53	Writing $\frac{dy}{dt}$=8 $\frac{dx}{dt}$	
	Getting 6$\frac{dy}{dt}$ =3x^2 $\frac{dx}{dt}$	1
	Getting 3x^2 = 48 and x = ±4	1
	Getting the point (4, 11)	1
	Getting the point (- 4 , $\frac{31}{3}$	1
54	Taking x = atan θ	1
	Writing I = $\int \frac{asec^2\theta}{\sqrt{a^2tan^2\theta+a^2}}$ dθ = $\int sec\theta d\theta$	1
	I = log | x + $\sqrt{x^2+a^2}$| - log |a| + C I = log | x + $\sqrt{x^2+a^2}$ |+c	1
	Writing $\int \frac{1}{x^2\ 2x+3}$ dx $\int \frac{1}{(x+1^2+\sqrt{2})^2}$ dx	1
	Getting $\frac{1}{\sqrt{2}} tan^{-1}(\frac{x+1}{\sqrt{2}}$)+c	1
55		
	Writing Area A = 4 $\int_0^q ydx$	1
	Writing Area A =4$\int_0^4 \sqrt{a^2-x^2}$ dx	1
	Getting Area A = 4 $\left[\frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}\right]_0^a$	1
	Getting area = πa^2 square unit. Note:Units are not compulsory	1

56	Writing $\frac{dy}{dx} + \frac{2y}{x}$ = xlogx OR P = $\frac{2}{x}$ and Q = x logx	1
	Getting I.F = $\int \frac{2}{x} dx = e^{2\log x} = x^2$	1
	Writing y (I.F) = $\int Q\ (I.F)dx + c$	1
	Getting y (x^2) = (logx).$\frac{x^4}{4} - \frac{1}{4}\int x3dx.$	1
	Getting general Solution, $yx^2 = \frac{x^4 logx}{4}$ - $\frac{x4}{16} + C$	1
57	 	1
	Correct Figure : Note Award mark for other correct figure writing w r t co-ordinate axis.	
	Writing $\overrightarrow{AP}$ *and* $\overrightarrow{AB}$ *are collinear and* $\overrightarrow{AP} = \lambda\ \overrightarrow{AB}$	
	Getting $\vec{r} = \vec{a} + \lambda\ (\vec{b} - \vec{a}\ )$ vector form	
	Writing $\vec{r} = x\hat{\imath} + y\hat{\imath} + z\hat{k}$ $\vec{a} = x_1\hat{\imath} + y_1\hat{\imath} + z_1\hat{k}$ $\vec{b} = x_2\hat{\imath} + y_2\hat{\imath} + z_2\hat{k}$	
	Getting the Cartesian form $\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}$	
58	n = 6, p = ½ and q = ½	1
	Writing P (X = x) = $nc_x p^x q^{n-x}$	1
	P(x = 5) = $6C_5$ (½$)^6$ = $\frac{3}{32}$	1
	P(x = 5) + P(x = 6) = $6C_5$ (½$)^6$ + $6C_6$ (½$)^6$	1
	Getting P(x = 5) + P(x = 6) = $\frac{7}{64}$	1

<table>
<tr><td>59</td><td>

Drawing the graph of '2' lines carries 2 mark and shading the feasible region carries 1 mark</td><td>2+1=3</td></tr>
<tr><td></td><td>Getting corner points A (0,5) D(5,0) E (4,3) and O(0,0)</td><td>1</td></tr>
<tr><td></td><td><table>
<tr><th>Corners Points</th><th>z = 3x + 2y</th></tr>
<tr><td>A (0,5)</td><td>10</td></tr>
<tr><td>D (5,0)</td><td>15</td></tr>
<tr><td>E (4, 3)</td><td>18</td></tr>
<tr><td>O (0, 0)</td><td>0</td></tr>
</table></td><td>1</td></tr>
<tr><td></td><td>The maximum value of z is 18 at the corner point E (4,3)</td><td>1</td></tr>
<tr><td></td><td>OR</td><td></td></tr>
<tr><td></td><td>I = $\int_0^a f(x)dx$
Putting x = a-t the dx= -dt and x=0 then t=a
and x = a then t = 0</td><td>1</td></tr>
<tr><td></td><td>Getting I = - $\int_a^0 f(a-t)dt$</td><td>1</td></tr>
<tr><td></td><td>Getting I = $\int_0^a f(a-x))dx$</td><td>1</td></tr>
<tr><td></td><td>Writing I = $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}dx$ and Getting I = $\int_0^a \frac{\sqrt{a-x}}{\sqrt{a-x}+\sqrt{x}}dx$</td><td>1</td></tr>
<tr><td></td><td>Getting 2I = $\int_o^q 1\,dx$</td><td>1</td></tr>
<tr><td></td><td>Getting I = $^{a}/_{2}$</td><td>1</td></tr>
<tr><td>60</td><td>Writing $\lim_{x\to 2^-} f(x) = \mathrm{Lim}_{x\to 2^+} f(x) = f(2)$</td><td>1</td></tr>
<tr><td></td><td>Getting $\lim_{x\to 2^-} f(x) = 4k$</td><td>1</td></tr>
<tr><td></td><td>Getting $\lim_{x\to 2^+} f(x) = 3$</td><td>1</td></tr>
<tr><td></td><td>Getting k = ¾</td><td>1</td></tr>
</table>

	OR	1
	Applying $C_1 - C_2$ and $C_2 - C_3$ and getting $\begin{vmatrix} 4-x & 0 & 2x \\ x-4 & 4-x & 2x \\ 0 & x-4 & x+4 \end{vmatrix}$	2
	Getting $= (4-x)^2 \begin{vmatrix} 1 & 0 & 2x \\ -1 & 1 & 2x \\ 0 & -1 & x+4 \end{vmatrix}$	1
	On expansion getting $= (4-x)^2 (5x+4)$	1