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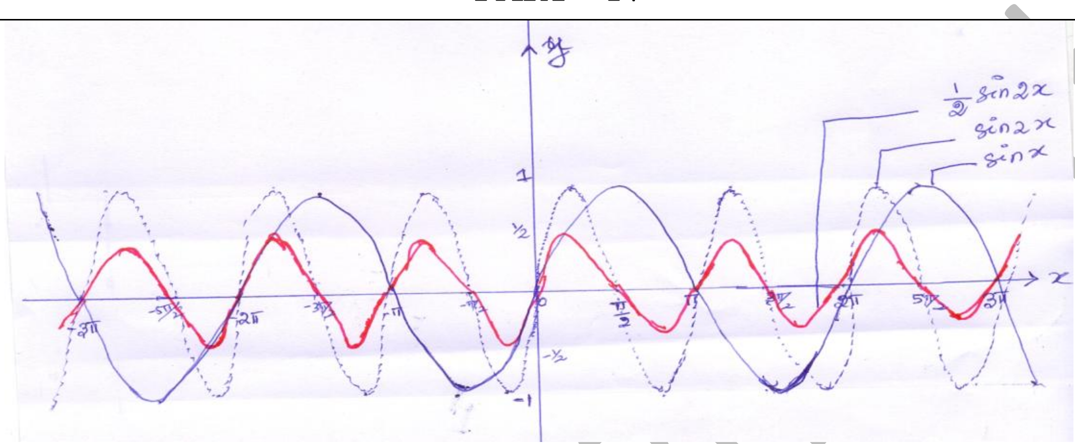
PUBLIC EXAMINATION 2019

XI - MATHEMATICS **TENTATIVE ANSWER KEY** **12.03.2019**

ANSWER KEY		
Q.No	PART – I (TYPE - A)	MARKS
1.	(d) 8	1
2.	(b) n^2+2n-1	1
3.	(b) $\sin^{-1}(\tan x)+c$	1
4.	(a) a = b	1
5.	(a) 4×5^4	1
6.	(c) f(x) is not differentiable at x =a	1
7.	(a) $\frac{1}{2}$	1
8.	(a) tan x	1
9.	(a) $\alpha+3\beta=11$	1
10.	(c) -2 and -1	1
11.	(d) 0	1
12.	(b) $\lim\limits_{x\to0} f(x)$ does not exist	1
13.	(a) both irrational	1
14.	(b) $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$	1
15.	(d) $\frac{1}{3}$	1
16.	(a) $\frac{2\vec{a}+\vec{b}}{3}$	1
17.	(d) [-10,6]	1
18.	(d) $1+2x+3x^2+$........	1
19.	(c) $[-5,\infty)$	1
20.	(c) a scalar matrix	1
	PART – II	
21.	Horizontal line test is used to check whether a function is one-one,onto or not.	2
22.	WKT, $nC_r=\frac{n!}{r!(n-r)!}, nP_r=\frac{n!}{(n-r)!}$ The relationship between permutation and combination is $nC_r=\frac{nP_r}{r!}$	1 1

23.	The required numbers is = $1\times8\times7\times2$ = 112 (6 | | | 0 or 5)	1 1
24.	$2x^2+xy-3y^2=0$ $(2x+3y)(x-y)=0$ The separate equation of a straght line is 2x+3y =0,x-y =0	2
25.	A square matrix $A=\left[a_{ij}\right]_{n\times n}$ is called a **diagonal matrix** if a_{ij}=0 whenever $i\neq j$ A square matrix $A=\left[a_{ij}\right]_{n\times n}$ is called a **scalar matrix** if $a_{ij}=\begin{cases} c & i=j \\ 0 & i\neq j\end{cases}$ where c is a fixed number.	1 1
26.	Let $\vec{a}=5\hat{i}-3\hat{j}+4\hat{k}$ Unit vector = $\pm\frac{\vec{a}}{\lvert\vec{a}\rvert}=\pm\frac{5\hat{i}-3\hat{j}+4\hat{k}}{\sqrt{50}}$	2
27.	A function $f:[a,b]\to R$ is said to be continuous on the closed interval [*a*, *b*] if it is continuous on the open interval (*a*, *b*) and $\lim\limits_{x\to a^+} f(x)=f(a)$ and $\lim\limits_{x\to b^-} f(x)=f(b)$	2
28.	$\lim\limits_{x\to 0^-}\sqrt{x}$ is does not exist $\lim\limits_{x\to 0^+}\sqrt{x}=0$ $\lim\limits_{x\to 0}\sqrt{x}$ is does not exist	1 1
29.	S = {1,2,…10} n(s) = 10 A = {3,6,9} n(A) = 3 P(A) = $\frac{3}{10}$	2
30.	$A\times A=\{(a,a):a\in A\}$ is not correct. Since $A\times A=\{(a,b):a,b\in A\}$ is only true	1 1
	PART – III	
31.	$R=\frac{u^2\sin2\alpha}{g}=\frac{80\times80\times\sin2\alpha}{32}$ $=200\sin2\alpha \quad \because \sin2\alpha\leq1$ Maximum distance $=200\,ft$ The required angle is $\frac{\pi}{4}$	1 1 1
32.	$T_{r+1}=7c_r(2)^7(-3)^{7-r}(x)^{7-r}$ For coefficient of x^3, 7-r = 3⇒r = 4 coefficient of x^3 = $7c_4(2)^7(-3)^3$ $=-15120$	1 2

33.	Nearest point is $\frac{x-x_1}{a}=\frac{y-y_1}{b}=\frac{-(ax_1+by_1+c)}{a^2+b^2}$ $(x_1,y_1)=(0,0)$,a=1,b=-2,c=-5 $\frac{x}{1}=\frac{y}{-2}=\frac{-(0+0-5)}{5}$ $x=1, y=-2$ Nearest point is $(x_1,y_1)=(1,-2)$	2 1
34.	Let A be a square matrix.Then $A=\frac{1}{2}(A+A^T)+\frac{1}{2}(A-A^T)$ WKT, (A+A^T)is a symmetric , (A-A^T)is a skew-symmetric A can be written as sum of a symmetric skew symmetric matrices.	1 1 1
35.	$\vec{a}+2\vec{b}=-\vec{c}$ $\lvert\vec{a}\rvert^2+4\lvert\vec{b}\rvert^2+4\vec{a}.\vec{b}=\lvert\vec{c}\rvert^2$ $9+64+4\lvert\vec{a}\rvert\lvert\vec{b}\rvert\cos\theta=49$ $\cos\theta=\frac{-1}{2}$ $\theta=\frac{2\pi}{3}$	1 1 1
36.	Let f(x) = cot x + tan x cot x is continuos in $R-n\pi$ tan x is continuos in $R-(n+1)\frac{\pi}{2}$ $\therefore$ f(x) is continuos in $R-\frac{n\pi}{2}, n\in Z$	1 1 1
37.	$y=\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ Put $x=\tan\theta\Rightarrow\theta=\tan^{-1}x$ $y=\sin^{-1}\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}\right)$ $=\sin^{-1}(\cos 2\theta)$ $=\sin^{-1}\left[\sin\left(\frac{\pi}{2}-2\theta\right)\right]$ $y=\frac{\pi}{2}-2\tan^{-1}x$ $\frac{dy}{dx}=\frac{-2}{1+x^2}$	1 1 1
38.	$x=a(t-\sin t)\Rightarrow\frac{dx}{dt}=a(1-\cos t)$ $y=a(1-\sin t)\Rightarrow\frac{dy}{dt}=a(\sin t)$ $\frac{dy}{dx}=\frac{a\sin t}{a(1-\cos t)}=\frac{\sin t}{1-\cos t}$	1 1 1

39.	$\int (x+3)\sqrt{x+2}\,dx = \int (x+2+1)\sqrt{x+2}\,dx$ $= \int (x+2)^{\frac{3}{2}}dx + \int (x+2)^{\frac{1}{2}}dx$ $= \frac{2}{5}(x+2)^{\frac{5}{2}} + \frac{2}{3}(x+2)^{\frac{3}{2}} + c$	1 2
40.	$f: X \to N$ is defined by f(x) = n+3 Since f is one-one and onto function $\therefore$ suitable Domain is $\{-2,-1,0\} \cup N$ (or) $\{-2,-1,0,1,2.................\}$	 1 2
	PART – IV	
41.(a)		5
	(b) i) <u>Slope intercept form :</u> y=mx+c ,c≠ 0 ii)<u>Point and slope form:</u> $y - y_1 = m(x - x_1)$ iii)<u>Two point form:</u> $\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$ iv)<u>Intercept form:</u> $\frac{x}{a} + \frac{y}{b} = 1$ v)<u>Normal form:</u> $x\cos\alpha + y\sin\alpha = p$	1 1 1 1 1
42.	(a) $\sqrt{6-4x-x^2} = x+4$ $6-4x-x^2 = (x+4)^2$ $x^2+6x+5=0$ $x=-1, x=-5$ since $x \geq -4$ $x=-1$	 1 2 2
	(b) InΔABC, $\Delta = \frac{1}{2}ab\sin C$ $= \frac{1}{2}ab\left(2\sin\frac{C}{2}\cos\frac{C}{2}\right)$ $= ab\sqrt{\frac{(s-a)(s-b)}{ab}}\sqrt{\frac{s(s-c)}{2}}$ $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$	1 1 1 2
43.	(a) $\tan\frac{A-B}{2} = \frac{a-b}{a+b}\cot\frac{C}{2}$	1

	$\frac{a-b}{a+b}\cot\frac{C}{2}=\frac{2R\sin A-2R\sin B}{2R\sin A+2R\sin B}\cot\frac{C}{2}$ $=\cot\frac{A+B}{2}\tan\frac{A-B}{2}\cot\frac{C}{2}$ $=\cot\left(\frac{\pi}{2}-\frac{C}{2}\right)\tan\frac{A-B}{2}\cot\frac{C}{2}$ $=\tan\frac{C}{2}\tan\frac{A-B}{2}\cot\frac{C}{2}$ $=\tan\frac{A-B}{2}$	1 1 1 1
	(b) $\frac{\sin\left(x-\lfloor x\rfloor\right)}{x-\lfloor x\rfloor}=\begin{cases}\frac{\sin(x-(-1))}{x-(-1)} & if\ -1<x<0\\ \frac{\sin(x-0)}{x-0} & if\ 0<x<1\end{cases}\Rightarrow f(x)=\begin{cases}\frac{\sin(x+1)}{(x+1)} & if\ -1<x<0\\ \frac{\sin x}{x} & if\ 0<x<1\end{cases}$ $\lim_{x\to0^-}f(x)=\frac{\sin1}{1}=\sin1$ $\lim_{x\to0^+}f(x)=1$ $\lim_{x\to0^-}f(x)\neq\lim_{x\to0^+}f(x)$ Hence the limit doesn't exist	2 2 1
44.	(a) <u>step - 1:</u> $p(n)=a^n-b^n$ is divisible by (a-b) put n=1 we get, $p(1)=a-b$ is divisible by (a-b) $\therefore$ p(1) is true <u>step - 2:</u> Assume that $p(k)=a^k-b^k$ is divisible by(a-b) is true Let $p(k)=a^k-b^k=\lambda(a-b)$ <u>step - 3:</u>To prove $p(k+1)=a^{k+1}-b^{k+1}$ is divisible by(a-b) $p(k+1)=a^{k+1}-ab^k+ab^k-b^{k+1}$ $=a(a^k-b^k)+b^k(a-b)$ $=a(\lambda(a-b)+b^k(a-b)$ $=(a-b)(a\lambda+b^k)$ which is divisible by (a-b) $\therefore$ By mathematical induction $p(n)=a^n-b^n$ is divisible by (a-b) , $n\in N$	1 1 2 1
	(b) $\int\frac{2x+4}{x^2+4x+6}dx$ $2x+4=A\frac{d}{dx}(x^2+4x+6)+B$ $2x+4=A(2x+4)+B$ Equating the coefficient of x and constant term $A=1,B=0$ $\frac{2x+4}{x^2+4x+6}dx=\int\frac{2x+4}{x^2+4x+6}dx+\int\frac{0}{x^2+4x+6}dx$ $=\log\left\|x^2+4x+6\right\|+c$	2 1 2

45.	(a) $\sqrt[3]{x^3+7}=(x^3+7)^{\frac{1}{3}}$ $=\left[x^3(1+\frac{7}{x^3})\right]^{\frac{1}{3}}=x+\frac{7}{3}\times\frac{1}{x^2}-.........$ $\sqrt[3]{x^3+4}=(x^3+4)^{\frac{1}{3}}=\left[x^3(1+\frac{4}{x^3})\right]^{\frac{1}{3}}$ $=x+\frac{4}{3}\times\frac{1}{x^2}-.........$ $\sqrt[3]{x^3+7}-\sqrt[3]{x^3+4}=(x+\frac{7}{3}\times\frac{1}{x^2}-)-(x+\frac{4}{3}\times\frac{1}{x^2}-)$ $=\frac{1}{x^2}$ (app)	1 1 1 2
	(b) $\vec{a}+\vec{b}=2\hat{i}+3\hat{j}+4\hat{k}$, $\vec{a}-\vec{b}=-\hat{j}-2\hat{k}$ $\hat{n}=\pm\frac{(\vec{a}+\vec{b})\times(\vec{a}-\vec{b})}{\left\|(\vec{a}+\vec{b})\times(\vec{a}-\vec{b})\right\|}$ $=\pm\left(\frac{-2\hat{i}+4\hat{j}-2\hat{k}}{\sqrt{24}}\right)$ $=\pm\left(\frac{-\hat{i}+2\hat{j}-\hat{k}}{\sqrt{6}}\right)$ (or) $\pm\left(\frac{\hat{i}-2\hat{j}+\hat{k}}{\sqrt{6}}\right)$	2 2 1
46.	(a) $x^2+y^2=4$ $\frac{dy}{dx}=-\frac{x}{y}$ $\frac{d^2y}{dx^2}=-\left[\frac{y.1-x\frac{dy}{dx}}{y^2}\right]$ $=-\frac{x^2+y^2}{y^3}=\frac{-4}{y^3}$	1 2 2
	(b) Let A_1,A_2,A_3 be the event of X,Y,Z becoming manager Let B be the event of bonus scheme introduced $X:Y:Z=4:2:3$ $P(A_1)=\frac{4}{9},P(A_2)=\frac{2}{9},P(A_3)=\frac{3}{9}$ $P(B/A_1)=0.3,P(B/A_2)=0.5,P(B/A_3)=0.4$ $P(A_3/B)=\frac{P(A_3)P(B/A_3)}{P(A_1)P(B/A_1)+P(A_2)P(B/A_2)+P(A_3)P(B/A_3)}$ $=\frac{12}{34}=\frac{6}{17}$	1 1 3

47.	(a) $\|A\|=\begin{vmatrix}1 & x^2 & x^3\\1 & y^2 & y^3\\1 & z^2 & z^3\end{vmatrix}$ put x=y $\begin{vmatrix}1 & y^2 & y^3\\1 & y^2 & y^3\\1 & z^2 & z^3\end{vmatrix}=0$ $\therefore$ (x-y) is a factor similarly (y-z)(z-x) are also factors. The other factor is $K(x^2+y^2+z^2)+l(xy+yz+zx)$ $\begin{vmatrix}1 & y^2 & y^3\\1 & y^2 & y^3\\1 & z^2 & z^3\end{vmatrix}=K(x^2+y^2+z^2)+l(xy+yz+zx)\times(x-y)(y-z)(z-x)$ putting x=0,y=1 ,z=2$\Rightarrow$5k+2l=2.......(1) putting x=0,y=-1 ,z=1$\Rightarrow$2k-l=-1.........(2) from (1)&(2)k=0,l=-1 $\begin{vmatrix}1 & y^2 & y^3\\1 & y^2 & y^3\\1 & z^2 & z^3\end{vmatrix}=(x-y)(y-z)(z-x)(xy+yz+zx)$	1 1 1 1 1
	(b) $\int\sqrt{(x^2+x+1)}dx=\int\left(\sqrt{\left(x+\frac{1}{2}\right)^2+\left(\frac{\sqrt{3}}{2}\right)^2}\right)dx$ $=\left(\frac{x+1/2}{2}\right)\left(\sqrt{(x^2+x+1)}\right)+\frac{3/4}{2}\log\left\|\left(x+\frac{1}{2}\right)+\sqrt{(x^2+x+1)}\right\|+c$ $=\frac{2x+1}{4}\left(\sqrt{(x^2+x+1)}\right)+\frac{3}{8}\log\left\|\left(\frac{2x+1}{2}\right)+\sqrt{(x^2+x+1)}\right\|+c$	2 3

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