CODE: SET 1 **KENDRIYA VIDYALAYA SANGATHAN GUWAHATI REGION** **TOTAL PAGES :2**

HALF YEARLY EXAMINATION 2018-19

CLASS: XII **TIME: 3 HRS**

SUBJECT: MATHEMATICS **MM: 100**

General Instructions: -

1. All Questions are compulsory.
2. This Question Paper contains 29 questions.
3. Section A contains 4 Questions carrying 1 mark each.
4. Section B contains 8 Questions carrying 2 marks each.
5. Section C contains 11 Questions carrying 4 marks each.
6. Section D contains 6 Questions carrying 6 marks each.

Section A		
		Marks
Q1.	Find the value of a and b for which $\begin{bmatrix} a & b \\ -a & 2b \end{bmatrix}\begin{bmatrix} 2 \\ -1 \end{bmatrix}=\begin{bmatrix} 5 \\ 4 \end{bmatrix}$.	1
Q2.	State where the function $f:N \to N$given byf(x) = 5x is injective.	1
Q3.	Let * be the binary operation on N given by a * b = HCF (a,b) a, b ∈ N. write the value of 22 * 4.	1
Q4.	If $\left\|\vec{a}+\vec{b}\right\|=\left\|\vec{a}-\vec{b}\right\|$, show that $\vec{a}$ and $\vec{b}$ are perpendicular.	1
Section B		
Q5.	The side of an equilateral triangle is increasing at the rate of 0.5 cm/sec. Find the rate of increase of the perimeter.	2
Q6.	Find the angle between $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ if $\vec{a}$ = $2\vec{\imath}$ -$\vec{\jmath}$ +$\vec{k}$ and $\vec{b}$ =$3\vec{\imath}$+$\vec{\jmath}$-$2\vec{k}$.	2
Q7.	If A = $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, prove that $A^3 - 4A^2 + A = 0$.	2
Q8.	Solve: $\tan^{-1}2x + \tan^{-1}3x = \frac{\pi}{4}$.	2
Q9.	Evaluate: $\int_1^2 \left(\frac{x-1}{x^2}\right) e^x dx$.	2
Q10.	If $y = \sin^{-1}x$ show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$.	2
Q11.	Solve the differential equation $\frac{dy}{dx} = y(e^x+1)$.	2
Q12.	Evaluate $\int_0^{\frac{\pi}{2}} \frac{sin^4 x}{sin^4 x + cos^4 x} dx$	2
Section C		
Q13.	Find the constant a and b so that the function 'f' defined below is continuous at 3 and 5 $f(x) = \begin{cases} 1, x \le 3 \\ ax + b, 3 < x < 5. \\ 7, \ge 5 \end{cases}$	4
Q14.	Differentiate the following w.r.to x: $y = x^{\cos x} + \cos x^x$.	4
Q15.	For the function f(x) = $-2x^3 - 9x^2 - 12x + 1$, find the interval in which f(x) is increasing and decreasing.	4
Q16.	Evaluate: $\int \frac{1+\cot x}{x+\log \sin x} dx$.	4
Q17.	Consider the binary operation * on the set {1, 2, 3, 4, 5} defined by minimum (a, b) . Write the operation table of the operation * .	4
Q18.	If $\vec{a}$ = $\vec{\imath}$ -$\vec{\jmath}$ +$2\vec{k}$ and $\vec{b}$ =$2\vec{\imath}$+$\vec{\jmath}$-$\vec{k}$, find $\left(2\vec{a}-\vec{b}\right)\times\left(\vec{a}+2\vec{b}\right)$.	4
Q19.	Show that the function f: R→R defined as f(x)= x^2 is neither one –one nor onto.	4

Q20.	Sum that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$.	4
Q21.	Solve the differential equation $(x^3+y^3)dy - x^2y\,dx = 0$.	4
Q22.	Without expanding , show that $\begin{vmatrix} cosec^2x & cot^2x & 1 \\ cot^2x & cosec^2x & -1 \\ 42 & 40 & 2 \end{vmatrix} = 0$	4
Q23.	Find the area of the region { (x, y) : $x^2+y^2 \leq 4$, $x + y \geq 2$ }.	4
	Section D	
Q24.	Determine which of the following binary operation on the set N are associative and which are commutative. i. $\vec{a} * \vec{b} = 1$, ∀ a,b ∈ N ii. $\vec{a} * \vec{b} = \frac{a+b}{2}$, ∀ a,b ∈ N	6
Q25.	Solve using matrices x – y + z =1 2x+y –z =2 x- 2y - z = 4.	6
Q26.	Using properties of determinants, prove that the following $\begin{vmatrix} 3a & -a+b & -a+c \\ a-b & 3b & c-b \\ a-c & b-c & 3c \end{vmatrix}$ = 3(a+b+c)(ab+bc+ac).	6
Q27.	If the lengths of three sides of a trapezium other than base are equal to 10cm, then find the area of the trapezium when it is maximum.	6
Q28.	Draw a rough sketch and find the area of the region bounded by the two parabolas $y^2 = 4x$ and $x^2 = 4y$ by method of integration.	6
Q29.	Evaluate: $\int \frac{2x+1}{\sqrt{x^2+4x+3}}\,dx$. **Or** Evaluate the following definite integrals as limit of sums: $\int_1^4 (x^2 - x)\,dx$.	6

[END]