



RISE 'n' SHINE CONVENT SCHOOL-DHAMDHA
1st PERIODIC EXAMINATION(2019-2020)
Class – XII
Subject - Mathematics

Date:- 11/09/2019

Roll No :

Time:-3 hrs

Max. Marks : 80

General Instructions :-

1. All questions are compulsory.
2. The question paper consists of 36 questions divided into three Sections A, B, C and D. Section-A comprises of 20 questions of one mark each, Section - B comprises of 6 questions of 2 marks each, Section - C comprises of 6 questions of 4 marks each and Section - D comprises of 4 questions of 6 marks each.
3. Use of calculators and other electronic appliances are not permitted.

SECTION- A

Choose correct answer in the following

- Q.1 Let R be a relation in the set N given by $R = \{(a, b) : a = b - 2, b > 6\}$ then
 (A) $(8, 7) \in R$ (B) $(8, 6) \in R$ (C) $(3, 8) \in R$ (D) $(2, 4) \in R$
- Q.2 Let $R = \{(a, a^3) : a \text{ is prime number less than } 4\}$ be a relation. Then range of R is
 (A) {8} (B) {8, 27} (C) {27} (D) None of these
- Q.3 The Number of binary operations on the set $\{a, b\}$
 (A) 10 (B) 20 (C) 16 (D) 8
- Q.4 Consider the set A having 3 elements and set B having 4 elements then the number of injective function from set A to Set B.
 (A) 12 (B) 144 (C) 7 (D) 24
- Q.5 Let $f : R \rightarrow R$ be a function define by $f(x) = 2x + 3$ then $f^{-1}(x)$ is equal to
 (A) $2x - 3$ (B) $\frac{x-3}{2}$ (C) $\frac{x-2}{3}$ (D) $\frac{1}{2x+3}$

- Q.6 If $\tan^{-1} x = \frac{\pi}{10}$ for some $x \in R$ then the value of $\cot^{-1} x$ is
 (A) $\frac{\pi}{5}$ (B) $\frac{2\pi}{5}$ (C) $\frac{3\pi}{5}$ (D) $\frac{4\pi}{5}$
- Q.7 The domain of $\sin^{-1} 2x$ is
 (A) $[0,1]$ (B) $[-1,1]$ (C) $\left[-\frac{1}{2}, \frac{1}{2}\right]$ (D) $[-2,2]$
- Q.8 If A, B are symmetric matrices of same order, then $(AB - BA)$ is a
 (A) Skew symmetric matrix (B) Identity matrix
 (C) Zero matrix (D) Symmetric matrix
- Q.9 If $A = \begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and $A = A^T$ then
 (A) $x = 0, y = 5$ (B) $x = y$ (C) $x + y = 5$ (D) None of these
- Q.10 If A be a square matrix of order 3×3 , then find the value of $|3A|$ if $|A| = 2$
 (A) 6 (B) 81 (C) 36 (D) 54

Give answers in very short:

- Q.11 Give an example of a relation which is symmetric but neither reflexive nor transitive .
- Q.12 If $f: R \rightarrow R$ be given by $f(x) = (3 - x^3)^{1/3}$ then evaluate $f \circ f(x)$
- Q.13 Evaluate $\tan^{-1}(-\sqrt{3}) + \sec^{-1}(-2)$
- Q.14 $\frac{d}{dx} e^{\sec x}$
- Q.15 Find the value of K so that the function $f(x)$ is continuous at $x = \frac{\pi}{2}$
- $$f(x) = \begin{cases} \frac{k \cos x}{3} & , \text{if } x \neq \frac{\pi}{2} \\ \frac{\pi - 2x}{3} & , \text{if } x = \frac{\pi}{2} \end{cases}$$
- Q.16 Using differentials find the approximate value of $((255))^{1/4}$
- Q.17 If the radius of a sphere is measured as 7 m with error of 0.02 m ,then find the approximate error in calculating its volume.
- Q.18 Check whether the function $f: R \rightarrow R$ defined by $f(x) = x^2$ is one- one ,onto.
- Q.19 If $x = \sin \theta$ and $y = \cos \theta$ then prove that $\frac{dy}{dx} = \frac{-x}{y}$

Q.20 Find the principal value of $\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$

SECTION- B

Q.21 Check whether the relation R in set of real number R defined by $R = \{ (a, b) : a \leq b^3 \}$, is reflexive symmetric and transitive

Q.22 Evaluate $\tan^{-1}\left[2 \cos\left\{2 \sin^{-1}\frac{1}{2}\right\}\right]$

Q.23 Show that $\cos x^2$ is continuous for all real value of x

Q.24 If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, $-1 < x < 1$ prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

Q.25 Verify the mean value theorem If $f(x) = x^2 - 4x - 3$ in the interval $[a, b]$ where $a = 1$ and $b = 4$

OR

Verify the Roll's value theorem for the function $f(x) = x^2 + 2x - 8$, $x \in [-4, 2]$

Q.26 If for any 3×3 square matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then write the value of $|(adjA)|$

SECTION- C

Q.27 Solve $\sin^{-1}\left(\frac{5}{x}\right) + \sin^{-1}\left(\frac{12}{x}\right) = \frac{\pi}{2}$

Q.28 If the function $f(x) = \begin{cases} 3ax + b & \text{if } x > 1 \\ 11 & \text{if } x = 1 \\ 5ax - 2b & \text{if } x < 1 \end{cases}$ is continuous at $x = 1$ find value of a and b

Q.29 Solve the linear equations using matrix method
 $2x + 3y + 3z = 5$, $x - 2y + z = -4$ and $3x - y - 2z = 3$

OR

If matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ Verify that $A^3 - 6A^2 + 9A - 4I = 0$ and hence find A^{-1}

Q.30 If $y = \sqrt{2^x + \sqrt{2^x + \sqrt{2^x + \dots \dots \dots \infty}}}$ prove that $(2y - 1) \frac{dy}{dx} = 2^x \log_e 2$

Q.31 Differentiate $\sin^{-1}\left\{\frac{2^{x+1}}{1+4^x}\right\}$

Q.32 Find the equation of normal to the curve $y = x^3 + 2x + 6$ which are parallel to the line $X + 14y + 4 = 0$

SECTION- D

Q.33 Using the properties of the determinants prove that

$$\begin{vmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{vmatrix} = 3(a+b+c).(ab+bc+ca)$$

Q.34 A window is in the form of the rectangle above which there is a semi circle. If perimeter of window is p cm Show that the window will allow maximum possible light only when the radius of semicircle is $\frac{p}{\pi+4}$ cm.

Q. 35 Using elementary transformations, find the inverse of Matrix $A = \begin{bmatrix} 2 & -3 & 3 \\ 2 & 2 & 3 \\ 3 & -2 & 2 \end{bmatrix}$

Q.36 Let $A = N \times N$ and $*$ be a binary operation on A defined by $(a, b) * (c, d) = (a + c, b + d)$ Show that the $*$ is commutative and associative. Find the identity element for $*$ on A if any.

OR

Let $f : [0, \infty) \rightarrow \mathbf{R}$ be a function defined by $f(x) = 5x^2 + 6x - 9$. Prove that f is not invertible. Modify, only the codomain of f to make f invertible and find its inv