SECTION –A (20 M)

Choose the correct answer from the given options for each question given below and each carries 2 marks.

1. If $A + 2B = \begin{bmatrix} 2 & -4 \\ 1 & 6 \end{bmatrix}$, $A' + B' = \begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$ then $A =$

A. $\begin{bmatrix} 0 & 4 \\ 3 & -8 \end{bmatrix}$ B. $\begin{bmatrix} 1 & -4 \\ -1 & 7 \end{bmatrix}$ C. $\begin{bmatrix} 0 & -4 \\ 3 & 8 \end{bmatrix}$ D. $\begin{bmatrix} 1 & 4 \\ 1 & -7 \end{bmatrix}$

2. If $\begin{pmatrix} 1 & 2 & x \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{pmatrix}$ is singular matrix, then $x =$

A. -3 B. 0 C. 1 D. 3

3. The rank of the matrix $\begin{bmatrix} 1 & 2 & -1 \\ 4 & 1 & 2 \\ 3 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$ is

A. 0 B. 1 C. 2 D. 3

4. The system of equations $x + y + z = 6,\ x + 2y + 3z = 10,\ x + 2y + \lambda z = \mu$ have infinite solutions. If

A. $\lambda = 3, \mu = -10$ B. $\lambda = -3, \mu = -10$

C. $\lambda = 3, \mu = 10$ D. $\lambda = -3, \mu = 10$

5. If $f(x) = \begin{cases} 4x-1\ , & x>4 \\ x^2-2\ , & -2 \le x \le 3 \\ 3x+4\ , & x<-2 \end{cases}$ is a function , then $f(5)+f(2)+f(-3) =$

A. 5 B. 11 C. 16 D. 19

6. If $f(x) = \sqrt{1+x} - 3\sqrt[4]{4-x}$, then the domain of the function is

A. $[-2,2]$ B. $(-2,2)$ C. $[-1,5]$ D. $[-1,4]$

7. If $f(x)$ and $g(x)$ are two functions such that $f(x)+g(x) = e^x$ and $f(x)-g(x) = e^{-x}$ then consider the following statements.

$I.\ f(x)$ is an even function

II. $g(x)$ is an odd function

A. Only I is true

B. Only II is true

C. Neither I nor II is true

D. Both I and II are true

8. If $f: \boldsymbol{R} \longrightarrow \boldsymbol{R}$ and $g: \boldsymbol{R} \longrightarrow \boldsymbol{R}$ defined by $f(x) = 5x-3, g(x) = x^2+3$ then $(gof^{-1})(0) =$

A. $\frac{25}{84}$ B. $\frac{18}{5}$ C. $\frac{24}{25}$ D. $\frac{84}{25}$

9. $7^{2n} + 3^{n-1}.2^{3n-3}$ is divisible by

A. 26 B. 25 C. 9 D. 7

10. For all integers $n \geq 1$, then which of the following is divisible by 9.

A. $8^n + 1$ B. $4^n - 3n - 1$ C. $3^{2n} + 3n - 1$ D. $10^n + 1$

Section B $(2 \times 5 = 10\ M)$

Answer any *TWO* of the following questions

11. Let $f: A \longrightarrow B$, $g: B \longrightarrow C$ be bijections then prove that $(gof)^{-1} = f^{-1}og^{-1}$.

12. Use Mathematical Induction to prove that $2.4^{2n+1} + 3^{3n+1}$ is divisible by $11, \forall\, n \in \boldsymbol{N}$.

13. Use Mathematical Induction to prove that

$$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$$

14. Solve the system of Non-Homogeneous equation by crammer's rule:

$$3x + 4y + 5z = 18$$
$$2x - y + 8z = 13$$
$$5x - 2y + 7z = 20$$