

Second Term Exam : 2024-25

Std. : 11th

Subject : Mathematics

Marks : 80

General Instructions :

* The question paper is divided into four sections.

- 1) Section 'A' : Q. No. 1 contain's eight multiple choice type of questions carrying one mark each. Q. No. 2 contain's four very short answer type of questions carrying one mark each.
- 2) Section 'B' : Q. No. 3 to Q. No. 14 contains twelve short answer type of questions carrying two marks each. Attempt any Eight.
- 3) Section 'C' : Q. No. 15 to Q. No. 26 contains twelve short answer type of questions carrying three marks each. Attempt any Eight.
- 4) Section 'D' : Q. No. 27 to Q. No. 34 contains eight long answer type of questions carrying four marks each. Attempt any Five.
- 5) Use of log table is allowed. Use of calculator is not allowed.
- 6) Figures to the right indicate full marks.
- 7) Use of graph paper is not necessary. Only rough sketch is expected.
- 8) For each MCQ correct answer must be written along with its alphabet.

Section 'A'

Q. 1 Select and write the correct answer.

[10]

- i) The measure of the angle between hour-hand and the minute hand of a clock at twenty minutes past two is _____
a) 50^0 b) 60^0 c) 54^0 d) 65^0
- ii) The value of $\cos \frac{2\pi}{15} \cos \frac{4\pi}{15} \cos \frac{8\pi}{15} \cos \frac{16\pi}{15}$ is _____
a) $\frac{1}{32}$ b) $\frac{1}{16}$ c) $\frac{1}{64}$ d) $\frac{1}{128}$
- iii) The equation of the line through A(-2, 3) and perpendicular to the line through B(1, 2) and C(2, 5) is _____
a) $x - 3y = 7$ b) $3x - y = 7$ c) $x + 3y = 7$ d) $3x + y = 7$
- iv) The variance of 19, 21, 23, 25 and 27 is 8. The variance of 14, 16, 18, 20 and 22 is _____
a) greater than 8 b) less than 8 c) $8 - 5 = 3$ d) 8
- v) The terms $k - 1$, k , $k + 2$, are consecutive terms of a G.P. so that k is _____
a) 2 b) -2 c) ± 2 d) $\frac{1}{2}$
- vi) If the coefficient of x^2 and x^3 in the expansion of $(3 + ax)^9$ are the same, then the value of a is _____
a) $-\frac{7}{9}$ b) $\frac{9}{7}$ c) $-\frac{9}{7}$ d) $\frac{7}{9}$
- vii) If $f(x) = \frac{1}{1-x}$, then $f[f\{f(x)\}]$ is _____
a) $x - 1$ b) $1 - x$ c) x d) $-x$

viii) If $f(x) = \left(\frac{4+5x}{4-7x} \right)^{\frac{4}{x}}$, for $x \neq 0$ and $f(0) = k$ is continuous at $x = 0$, then k is _____

a) e^7

b) e^3

c) $e^{\frac{3}{4}}$

d) e^{12}

Q. 2 Answer the following.

[04]

- Find the value of x , if $\begin{vmatrix} x & -1 & 2 \\ 2x & 1 & -3 \\ 3 & -4 & 5 \end{vmatrix} = 29$
- Find the equation of the circle with $A(2, -3)$ and $B(-3, 5)$ as end points of its diameter.
- Find the number of permutations of letters in word 'BALBHARATI'.
- Examine the countinuity of

$$f(x) = \frac{x^2 - 9}{x - 3}, \text{ for } x \neq 3$$

$$= 8, \text{ for } x = 3$$

Section 'B'

Attempt any Eight.

[16]

- Find the degree and radian measure of exterior and interior angle of a regular pentagon.
- State the signs of $\cos 4^\circ$ and $\cos 4^0$ which of these two functions is greater?
- If $A = \begin{bmatrix} 5 & 4 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 \\ 4 & -1 \end{bmatrix}$ then find C^T such that $3A - 2B + C = I$. Where I is the unit matrix of order z .
- Find the equation of the ellipse in standard form if the latus rectum has length 6 and foci are $(\pm 2, 0)$
- Find the eccentricity of the hyperbola, which is conjugate to the hyperbola $x^2 - 3y^2 = 3$
- From a bag containing 10 red, 4 blue and 6 black balls, a ball is drawn at random. Find the probability of drawing a red ball.
- Show that $(-1 + \sqrt{3}i)^3$ is a real number.

- Q. 10 Find the sum to 'n' terms
 $8 + 88 + 888 + 8888 + \dots$
- Q. 11 Prove by method of induction $(2^{3n} - 1)$ is divisible by 7. $\forall n \in \mathbb{N}$
- Q. 12 Find the domain and range of the relation
 $R = \{ (a, b) / b = |a - 1|, a \in \mathbb{Z}, |a| < 3 \}$
- Q. 13 Evaluate $\lim_{x \rightarrow \infty} \sqrt{x^2 + 4x + 16} - \sqrt{x^2 + 16}$
- Q. 14 Show that there is a root for the equation $2x^3 - x - 16 = 0$ between 2 & 3.

Section 'C'

Attempt any Eight.

[24]

- Q. 15 If $\sin A = \frac{-5}{13}$, $\pi < A < \frac{3\pi}{2}$ and $\cos B = \frac{3}{5}$, $\frac{3\pi}{2} < B < 2\pi$ find $\sin(A + B)$
- Q. 16 Find the values of $\sin \frac{\pi}{8}$
- Q. 17 If $A = \begin{bmatrix} 2 & -1 \\ 3 & -2 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 3 & -4 \\ 2 & -1 & 1 \end{bmatrix}$

verify that $(AB)^T = B^T \cdot A^T$

- Q. 18 Find the co-ordinates of the foot of the perpendicular drawn from the point $A(-2, 3)$ to the line $3x - y - 1 = 0$
- Q. 19 Calculate coefficient of variation of marks secured by a student in the exam, where the marks are 85, 91, 96, 88, 98, 82
- Q. 20 Find three numbers in G.P. such that their sum is 21 and sum of their squares is 189.

- Q. 21 Find the value of $\sum_{r=1}^4 {}^{21-r}C_4$

- Q. 22 Find the 5th term in the expansion of $\left(x^2 - \frac{4}{x^3}\right)^{11}$

- Q. 23 If $f(x) = 4[x] - 3$, where $[x]$ is greatest integer function of x , then find :

(a) $f(7.2)$

(b) $f(0.5)$

(c) $f(-5/2)$

- Q. 24 If u and v are differentiable functions of x such that $y = uv$ then

$$\frac{dy}{dx} = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$$

- Q. 25 Differentiate w.r.t. x if $y = \log e^{x^3} \log x^3$

- Q. 26 Show that the line $7x - 3y - 1 = 0$ touches the circle $x^2 + y^2 + 5x - 7y + 4 = 0$ at point $(1, 2)$

Section 'D'

Attempt any Five.

[20]

- Q. 27 If $\operatorname{cosec} \theta + \cot \theta = 5$, then evaluate $\sec \theta$

- Q. 28 Solve the following equation by using Cramer's Rule :

$$x + y - z = 1, 8x + 3y - 6z = 1, -4x - y + 3z = 1$$

- Q. 29 To find the condition that the line $y = mx + C$ is tangent to the

$$\text{ellipse } \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

- Q. 30 Form a group of 4 men, 4 women and 3 children, 4 persons are selected at random. Find the probability that :

- (i) no child is selected (ii) exactly 2 men are selected

- Q. 31 Solve the quadratic equation : $x^2 - (2 + i)x - (1 - 7i) = 0$

- Q. 32 Find n and r if ${}^n P_r = 720$ and ${}^n C_{n-r} = 120$

- Q. 33 If $A = [-7, 3]$, $B = [2, 6]$ and $c = [4, 9]$ then find :

- (i) $A \cup B$ (ii) $A \cap C$ (iii) $B' \cap C'$ (iv) $A - B$

- Q. 34 Evaluate : $\lim_{x \rightarrow \pi/6} \left[\frac{2\sin x - 1}{\pi - 6x} \right]$

