

MATHEMATICS (INTER PART-I Class 11th) 322 PAPER: I
Time: 2:30 hours **SUBJECTIVE**

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- Show that $\forall Z \in \mathbb{C}, Z\bar{Z} = |Z|^2$
- Prove that $\bar{Z} = Z \Leftrightarrow Z$ is real
- If Z_1 and Z_2 are complex numbers, then show that $\overline{Z_1 Z_2} = \bar{Z}_1 \cdot \bar{Z}_2$
- Write $\{x | x \in \mathbb{N} \wedge x \leq 10\}$ in the descriptive and tabular forms.
- Write the power set of $\{a, \{b, c\}\}$
- Show that $(p \wedge q) \rightarrow p$ is a tautology.
- Solve the system of linear equations $4x_1 + 3x_2 = 5, 3x_1 - x_2 = 7$
- Write any two properties of determinant.
- Define hermitian matrix.
- Solve the equation by completing square $x^2 + 4x - 1085 = 0$
- Solve the equation by quadratic formula $16x^2 + 8x + 1 = 0$
- Prove that $(-1 + \sqrt{-3})^4 + (-1 - \sqrt{-3})^4 = -16$

3. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- Define partial fractions and give one example.
- Write partial fractions of $\frac{x^2 - 10x + 13}{(x-1)(x^2 - 5x + 6)}$ without finding the unknown constants.
- Find A.P. if its n th term is $3n - 1$.
- Find three A.M. between 3 and 11.
- Find the 11th term of the G.P. $1 + i, 2, \frac{4}{1+i}, \dots$
- Sum the infinite geometric series $\frac{9}{4} + \frac{3}{2} + 1 + \frac{2}{3} + \dots$
- If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P., show that common ratio is $\pm \sqrt{\frac{a}{c}}$
- Determine the value of n if $\frac{n}{2}P = 30$
- How many triangles can be formed by joining the vertices of a polygon having 12 sides?
- Prove that $5^n - 2^n$ is divisible by 3 for $n = 2, 3$
- Calculate by means of binomial theorem $(21)^5$
- Expand $(2 - 3x)^{-2}$ up to 4 terms given that the expansion is valid.

(Turn Over)

GROUP: I
Marks: 80

4. Write short answers to any NINE questions: (2)

(2 x 9 = 18)

- Find 'r' when $\ell = 56$ cm, $\theta = 45^\circ$
- Verify that, $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ = \sin 30^\circ$
- Prove that $\sec^2 \theta - \operatorname{cosec}^2 \theta = \tan^2 \theta - \cot^2 \theta$
- Prove that $\tan\left(\frac{\pi}{4} - \theta\right) + \tan\left(\frac{3\pi}{4} + \theta\right) = 0$
- Prove that $\cot \alpha - \tan \alpha = 2 \cot 2\alpha$
- Express $\sin(x + 30^\circ) + \sin(x - 30^\circ)$ as product.
- Write the domain and range of $\tan x$.
- State the law of cosines.
- Find ' α ' by using half angle formula when $a = 283, b = 317, c = 428$
- Prove that $r_1 r_2 r_3 = \Delta^2$ (with usual notations)
- Find the value of $\tan^{-1}(-\sqrt{3})$
- Define trigonometric equation.
- Solve the equation $1 + \cos x = 0$

SECTION II

- (a) Find the value of λ if $B = \begin{bmatrix} 5 & 1 & 2 & 0 \\ 8 & 2 & 5 & 1 \\ 3 & 2 & 0 & 1 \\ 2 & \lambda & -1 & 3 \end{bmatrix}$ is singular. 5

(b) Show that the roots of $(mx + c)^2 = 4ax$ will be equal, if $c = \frac{a}{m}, m \neq 0$ 5
- (a) Resolve into partial fractions: $\frac{6x^3 + 5x^2 - 7}{2x^2 - x - 1}$ 5

(b) The sum of 9 terms of an A.P. is 171 and its eighth term is 31. Find the series. 5
- (a) Prove that $\frac{n-1}{C} + \frac{n-1}{C} = \frac{n}{r}$ 5

(b) Find the coefficient of x^n in the expansion of $\frac{(1+x)^2}{(1-x)^3}$ 5
- (a) If $\cot \theta = \frac{5}{2}$ and the terminal arm of the angle is in the first quadrant, find the value of $\frac{3 \sin \theta + 4 \cos \theta}{\cos \theta - \sin \theta}$ 5

(b) Reduce $\cos^4 \theta$ to an expression involving only function of multiples of θ raised to the first power. 5
- (a) Prove that $\frac{1}{r^2} + \frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} = \frac{a^2 + b^2 + c^2}{\Delta^2}$ 5

(b) Prove that $\sin^{-1} \frac{5}{13} + \sin^{-1} \frac{7}{25} = \cos^{-1} \frac{253}{325}$ 5

211-322-26000

Roll No. _____

MATHEMATICS
Time: 30 Minutes

(INTER PART-I Class 11th) 322-(II)

PAPER: I

GROUP: II
Marks: 20

OBJECTIVE
Code: 6194

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

- 1- $2 \tan^{-1} A$ equals
(A) $\tan^{-1} \left(\frac{2A}{1-A^2} \right)$ (B) $\tan^{-1} \left(\frac{A}{1-A^2} \right)$ (C) $\tan^{-1} \left(\frac{2A}{NA^2} \right)$ (D) $\tan^{-1} \left(\frac{3A}{1-A^2} \right)$
- 2- If ΔABC is right triangle such that $m \angle C = 90^\circ$, then with usual notations, the true statement is
(A) $a^2 = b^2 + c^2$ (B) $c^2 = a^2 + b^2$ (C) $b^2 = c^2 + a^2$ (D) $a^2 + b^2 + c^2 = 0$
- 3- $\tan(\pi - \alpha)$ is equal to
(A) $\tan \alpha$ (B) $-\tan \alpha$ (C) $\cot \alpha$ (D) $-\cot \alpha$
- 4- Middle term of $(a + b)^{14}$ is
(A) 8^{th} (B) 7^{th} (C) 6^{th} (D) 5^{th}
- 5- If ${}^nC_8 = {}^nC_{12}$, then $n =$ _____
(A) 4 (B) 8 (C) 20 (D) 12
- 6- If A, G, H have their usual meanings and 'a' and 'b' are positive distinct real numbers and $G > 0$, then
(A) $A > G > H$ (B) $A < G < H$ (C) $H > G > A$ (D) $G > H > A$
- 7- The number of roots of polynomial $8x^6 - 19x^3 - 27 = 0$ are
(A) 2 (B) 4 (C) 6 (D) 8
- 8- The inverse of square matrix exists if A is
(A) singular (B) non-singular (C) symmetric (D) null
- 9- The multiplicative inverse of complex number $(0, -1)$ is equal to
(A) $(0, 1)$ (B) $(1, 0)$ (C) $(-1, 0)$ (D) $(0, 0)$
- 10- Types of rational fractions are
(A) 3 (B) 2 (C) 4 (D) 1
- 11- If $\sin x = \cos x$, then $x =$ _____
(A) 45° (B) 30° (C) 0° (D) 60°

(Turn over)

(2)

- 12- $\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma}$ is called
(A) sine law (B) cosine law
(C) tangent law (D) fundamental law of trigonometry
- 13- If ${}^nP_2 = 30$, then 'n' = _____
(A) 6 (B) 4 (C) 5 (D) 8
- 14- The matrix $\begin{bmatrix} a & b & c & d \end{bmatrix}$ is
(A) square (B) unit (C) null (D) row
- 15- The inequality $4^n > 3^n + 4$ is true for
(A) $n = 1$ (B) $n \geq 2$ (C) $n = 0$ (D) $n < 2$
- 16- The domain of $f = \{(a, 1), (b, 1), (c, 1)\}$ is
(A) $\{a, b, c\}$ (B) $\{a\}$ (C) $\{1\}$ (D) $\{b, c\}$
- 17- $\cot^2 \theta - \operatorname{cosec}^2 \theta$ equals to
(A) 2 (B) 0 (C) 1 (D) -1
- 18- The reciprocals of the terms of _____ are in A.P.
(A) A. P. (B) H. P. (C) G. P. (D) none of these
- 19- If ω is the cube root of unity, then $(1 + \omega - \omega^2)^8 =$:
(A) 256 (B) -256 (C) -256 ω (D) 256 ω
- 20- The period of $3 \cos \frac{x}{5}$ is
(A) 2π (B) 10π (C) $\frac{\pi}{10}$ (D) $\frac{\pi}{5}$

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MATHEMATICS

(INTER PART-I Class 11th) 322 PAPER: I

GROUP: II

Time: 2:30 hours

SUBJECTIVE

Marks: 80

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- Simplify $(2, 6) \cdot (3, 7)$
- Find the multiplicative inverse of $Z = (\sqrt{2}, -\sqrt{5})$
- Show that $|Z|^2 = Z \cdot \bar{Z}$; $\forall Z \in \mathbb{C}$
- Write down power set of $\{9, 11\}$
- Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{4, 5, 6, \dots, 10\}$. Find $A - B$ and $B - A$
- Let 'G' be a group and $a, b \in G$, then prove that $ab = ac \Rightarrow b = c$
- Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$
- Show that $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix} = 0$
- Define rank of matrix.
- Find three cube roots of unity.
- Show that ' $x-2$ ' is a factor of $x^4 - 13x^2 + 36$
- Discuss the nature of roots of $x^2 + 2x + 3 = 0$

3. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- Define conditional equation.
- Resolve $\frac{7x+25}{(x+3)(x+4)}$ into partial fractions.
- If $a_{n-3} = 2n-5$, find the n th term of the sequence.
- How many terms of the series $-7 + (-5) + (-3) + \dots$ amount to 65?
- Find the 5th term of the G.P.: 3, 6, 12,
- Find the sum of the infinite geometric series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$
- If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k .
- Write $n(n-1)(n-2) \dots (n-r+1)$ in the factorial form.
- Find the value of n , when ${}^nC_5 = {}^nC_4$
- Use mathematical induction to prove the formula: $2 + 4 + 6 + \dots + 2n = n(n+1)$ for $n = 2$ and $n = 3$
- Expand $(1-x)^{1/2}$ up to 3 terms, taking the values of x such that the expansion is valid.
- Write the formula for middle term in the expansion of $(a+x)^n$; when n is an odd positive integer.

(Turn Over)

(2)

4. Write short answers to any NINE questions:

(2 x 9 = 18)

- Prove the identity $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ where ' θ ' is not an odd multiple of $\frac{\pi}{2}$
- If $\tan\theta = \frac{1}{\sqrt{7}}$ and terminal arm of angle is not in III quadrant. Find the value of $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$
- Find ' ℓ ' when $\theta = 65^\circ 20'$, $r = 18$ mm
- Prove without using table/calculator that $\sin 19^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ = \frac{1}{2}$
- Prove the identity $1 + \tan\alpha \tan 2\alpha = \sec 2\alpha$
- Prove that $\cos 330^\circ \sin 600^\circ + \cos 120^\circ \sin 150^\circ = -1$
- Find period of $\tan \frac{x}{7}$
- Write any two laws of tangents.
- Prove that $R = \frac{abc}{4\Delta}$
- Find the smallest angle of triangle ABC when $a = 37.34$, $b = 3.24$, $c = 35.06$
- Without using table/calculator, find $\cot^{-1}(-1)$
- Solve $\sin x + \cos x = 0$
- Find the value of ' θ ' satisfying the equation $2 \sin\theta + \cos^2\theta - 1 = 0$

SECTION II

5. (a) Solve the following system of linear equations by Cramer's rule:

5

$$\begin{cases} 2x_1 - x_2 + x_3 = 5 \\ 4x_1 + 2x_2 + 3x_3 = 8 \\ 3x_1 - 4x_2 - x_3 = 3 \end{cases}$$

- (b) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots, if $c^2 = a^2m^2 + b^2$ where $a \neq 0$, $b \neq 0$

5

6- (a) Resolve $\frac{x^2+15}{(x^2+2x+5)(x-1)}$ into partial fractions.

5

(b) Sum to n -terms the series $-2 + \cdot 22 + \cdot 222 + \dots$

5

7- (a) Find values of n and r ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3 : 6 : 11$

5

- (b) If $2y = \frac{1}{2^2} + \frac{1.3}{2!} + \frac{1}{2^4} + \frac{1.3.5}{3!} + \frac{1}{2^6} + \dots$ then prove that $4y^2 + 4y - 1 = 0$

5

8- (a) Prove that $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \tan\theta + \sec\theta$

5

- (b) Find $\sin(\alpha + \beta)$ and $\cos(\alpha + \beta)$ given that $\tan\alpha = \frac{3}{4}$, $\cos\beta = \frac{5}{13}$ and neither the terminal side of the angle α and nor that of β is in I quadrant.

5

9- (a) Show that $\frac{1}{2rR} = \frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca}$

5

- (b) Prove that $\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{3}{5} - \tan^{-1}\frac{8}{19} = \frac{\pi}{4}$

5

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