

MATHEMATICS	Intermediate Part-I (11th) (1st A 325)	Paper: I	First Group
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 / solve any EIGHT (8) questions:

(2x8 = 16)

- Find the multiplicative inverse of $(\sqrt{2}, -\sqrt{5})$.
- Separate $(\sqrt{3} + i)^3$ into real and imaginary parts.
- By constructing truth table show that $P \wedge \sim P$ is absurdity.
- For $A = \{1, 2, 3, 4\}$ state domain and range of relation of $\{(x, y) \mid y = x\}$. Also draw the graph.

v - Find matrix X if:
$$\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} X = \begin{bmatrix} 2 & 1 \\ 5 & 10 \end{bmatrix}$$

vi - Find inverse of matrix:
$$A = \begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$$

vii - Without expansion show that:
$$\begin{bmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{bmatrix} = 0$$

viii - Define rank of a matrix.

ix - Write down any two properties of cube roots of unity.

x - Use factor theorem to verify that $x - a$ is a factor of $x^n - a^n$, where 'n' is odd integer.

xi - If α, β are roots of $5x^2 - x - 2 = 0$, form the equation whose roots are $\frac{3}{\alpha}$ and $\frac{3}{\beta}$.

xii - Solve the equation $x^2 + 4x - 437 = 0$ by completing the square.

3. Write short answers / solve any EIGHT (8) questions:

(2x8 = 16)

i - Write resolution of $\frac{P(x)}{Q(x)}$ into partial fractions when $Q(x)$ has repeated linear factors.

ii - Resolve into partial fractions: $\frac{1}{x^2 - 1}$

iii - Resolve into partial fractions without finding values of the coefficients: $\frac{1}{(x-1)^2(x+1)}$

iv - If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in A.P., show that common difference is $\frac{a-c}{2ac}$.

v - Define 'n' Arithmetic Means between two given numbers.

vi - Write formula for sum of 'n' terms of an arithmetic series.

vii - Prove that H.M = $\frac{2ab}{a+b}$, if a, H, b are in H.P

viii - How many words can be formed from the letters of the word FASTING using all letters when no letter is repeated?

ix - Find the value of 'n', when ${}^nC_5 = {}^nC_4$

x - How many triangles can be formed by joining the vertices of the polygon having 12 sides?

xi - Verify $2 + 6 + 18 + \dots + 2 \times 3^{n-1} = 3^n - 1$ only for $n = 1, 2$

xii - Write statement of Binomial Theorem

4. Write short answers / solve any NINE (9) questions:

(2x9 = 18)

i - Define radian measure of an angle

ii - Find the trigonometric ratios of $-\frac{19}{3}\pi$

iii - Show that $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} + \frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \frac{2}{1 - 2\sin^2\theta}$

iv - Show that $\cot(\alpha + \beta) = \frac{\cot\alpha \cot\beta - 1}{\cot\alpha + \cot\beta}$

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v - Show that $\cos 2\theta = \frac{1 - \tan^2\theta}{1 + \tan^2\theta}$

vi - Prove that $\sin\left(\frac{\pi}{4} - \theta\right) \sin\left(\frac{\pi}{4} + \theta\right) = \frac{1}{2} \cos^2\theta$

vii - Find the periods of $\cot\delta x$

viii - In triangle ABC; $a = 93$, $c = 101$, $\beta = 80^\circ$. Find α

ix - Prove that $r = (s - b) \tan \frac{B}{2}$

x - Find the area of the triangle: $a = 18$, $b = 24$, $c = 30$

xi - Write three statements of the Law of Tangents.

xii - Find the value of $\tan\left(\cos^{-1}\frac{1}{\sqrt{2}}\right)$

xiii - Solve $\sin^2 x + \cos x = 1$ in $[0, 2\pi]$

SECTION – II

5 - (a) Find the inverse of the matrix: $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 2 \end{bmatrix}$

(5)

(b) Find the values of 'a' and 'b' if -2 and 2 are the roots of the polynomial $x^3 - 4x^2 + ax + b$.

(5)

6 - (a) Resolve $\frac{(x-1)(x-3)(x-5)}{(x-2)(x-4)(x-6)}$ into partial fractions.

(5)

(b) If I , m and n are $p^{\frac{m}{n}}$, $q^{\frac{n}{m}}$ and $r^{\frac{m}{n}}$ terms of A.P., then show that: $I(q - r) + m(r - p) + n(p - q) = 0$

(5)

7 - (a) Prove that ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$

(5)

(b) If 'x' is so small that its square and higher powers can be neglected, then show that $\frac{(1-x)^{\frac{1}{2}}(9-4x)^{\frac{1}{2}}}{(8+3x)^{\frac{1}{2}}} = \frac{3}{2} - \frac{61}{48}x$

(5)

8 - (a) If $\operatorname{cosec}\theta = \frac{m^2 + 1}{2m}$ and $m > 0$ $\left(0 < \theta < \frac{\pi}{2}\right)$ find the values of the remaining trigonometric ratios.

(5)

(b) If α, β, γ are the angles of a triangle ABC. Show that $\cot \frac{\alpha}{2} + \cot \frac{\beta}{2} + \cot \frac{\gamma}{2} = \cot \frac{\alpha}{2} \cot \frac{\beta}{2} \cot \frac{\gamma}{2}$

(5)

9 - (a) Show with usual notation that $r_1 + r_2 + r_3 - r = 4R$

(5)

(b) Prove that $\cos^{-1} \frac{63}{65} + 2 \tan^{-1} \frac{1}{5} = \sin^{-1} \frac{3}{5}$

(5)

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Roll No. of Candidate : _____

MATHEMATICS		Intermediate Part-I (11 th) (1st A 325-I)		Paper: I	Second Group
Time: 30 Minutes		OBJECTIVE Code: 6192		Marks: 20	
Q. No.	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 the relevant question number. Use marker or pen to fill in the circles. Cutting or filling of two or more circles will result zero mark in that question.				
1					
S. #	Questions	A	B	C	D
1	If $Z = \cos\theta + i\sin\theta$ then $ Z =$	0	1	-1	2
2	The property $\forall a \in \mathbb{R}, a = a$ is called	Reflexive	Symmetric	Transitive	Additive
3	For any two subsets A and B of U then $(A \cup B)' =$	$A' \cup B'$	$A \cup B$	$A \cap B$	$A' \cap B'$
4	For square matrix $(A)^t = -A$, then A is called	Symmetric	Hermition	Skew Symmetric	Skew Hermition
5	The order of $A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 7 & 4 \end{bmatrix}$ is	3×2	1×3	2×3	3×1
6	If α, β are roots of $ax^2 + bx + c = 0$, then $\alpha\beta =$	$\frac{c}{a}$	$-\frac{b}{a}$	$-\frac{c}{a}$	$\frac{b}{c}$
7	If ω is a cube root of unity then $1 + \omega + \omega^2 =$	1	0	-1	2
8	$\frac{x^2}{(x-1)(x+1)}$ is a fraction known as	Proper	Linear	Polynomial	Improper
9	If in an A.P $a_{n-3} = 2n - 5$ then $a_1 =$	1	2	3	4
10	The reciprocal of A.P is called	A.P	G.P	H.M	H.P
11	$\frac{n!}{r!(n-r)!} =$	nP_r	nC_r	${}^{n-1}C_r$	${}^{n+1}C_r$
12	The number of terms in the expansion of $(a + 2b)^{11}$ is	10	11	13	12
13	1° is approximately equal to	0.0175 rad	1.175 rad	1.0175 rad	π rad
14	$\sin\left(\frac{\pi}{2} + \alpha\right) =$	$\sin\alpha$	$-\sin\alpha$	$\cos\alpha$	$-\cos\alpha$
15	$\pm \sqrt{\frac{1 + \cos\alpha}{2}} =$	$\sin\frac{\alpha}{2}$	$\cos\frac{\alpha}{2}$	$\tan\frac{\alpha}{2}$	$\sin\alpha$
16	The period of $\cot 8x$ is	8π	$\frac{\pi}{8}$	π	16π
17	By the Law of Tangent $\frac{\tan\left(\frac{\alpha-\gamma}{2}\right)}{\tan\left(\frac{\alpha+\gamma}{2}\right)} =$	$\frac{a-c}{a+c}$	$\frac{a+b}{a-b}$	$\frac{a+c}{a-c}$	$\frac{b-c}{b+c}$
18	With usual notation $\frac{\Delta}{s-b} =$	r_1	r_3	r	r_2
19	$\cos(\tan^{-1}(0)) =$	0	∞	1	-1
20	Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in III quad is	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{7\pi}{4}$	$\frac{7\pi}{3}$

MATHEMATICS	Intermediate Part-I (11th) (1st A 325)	Paper: I	Second Group
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 / solve any EIGHT (8) questions: (2x8 = 16)

- Does the set $\{1, -1\}$ possess closure property with respect to i) addition ii) multiplication
- Factorize $9a^2 + 16b^2$
- Write down the power set of $\{a, \{b, c\}\}$
- Write the converse and inverse of the conditional $\neg p \rightarrow q$
- If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of 'a' and 'b'.
- Solve the system of linear equations: $2x_1 - 3x_2 = 5$, $5x_1 + x_2 = 4$
- Solve the matrix equation: $\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix} A - \begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} -1 & -4 \\ 3 & 6 \end{bmatrix}$ for A
- Show that $\begin{vmatrix} 2 & 3 & 0 \\ 3 & 9 & 6 \\ 2 & 15 & 1 \end{vmatrix} = \begin{vmatrix} 2 & 1 & 0 \\ 3 & 9 & 6 \\ 2 & 5 & 1 \end{vmatrix}$
- Solve the equation $x^2 - 2x - 899 = 0$ by completing the square.
- Evaluate: $(1 + \omega - \omega^2)^6$
- Use the remainder theorem to find the remainder when $x^2 + 3x + 7$ is divided by $x + 1$
- Find the condition that one root of $x^2 + px + q = 0$ is double of the other.

3. Write short answers / solve any EIGHT (8) questions: (2x8 = 16)

- Define improper rational fraction.
- From the identity $\frac{1}{(x+1)^2(x^2-1)} = \frac{A}{x-1} + \frac{B}{x+1} + \frac{C}{(x+1)^2} + \frac{D}{(x+1)^3}$, Find the values of A and D
- Write $\frac{2x+1}{(x-1)(x+2)(x+3)}$ into partial fractions.
- If $a = 1 - x + x^2 - x^3 + \dots$, $|x| < 1$ and $b = 1 + x + x^2 + x^3 + \dots$, $|x| < 1$, Show that $2ab = a + b$.
- The A.M between two positive integral numbers exceeds their (positive) G.M by 2 and their sum is 20, find the numbers.
- How many terms of the series $-9 - 6 - 3 + 0 + \dots$ amount to 66.
- Find A, G and H if $a = 2l$, $b = 4l$
- In how many ways the necklaces from 6 beads of different colours can be made?
- If ${}^nC_9 = {}^nC_{12}$, find n.
- Define non-occurrence of the event E.
- Show that the inequality $4^n > 3^n + 4$ is true for $n = 3, 4$
- Find the term independent of 'x' in the expansion of $\left(\frac{x}{2} + \frac{2}{x^2}\right)^{10}$

4. Write short answers / solve any NINE (9) questions: (2x9 = 18)

- Convert radian measure of angle $\frac{19\pi}{32}$ into the measure of sexagesimal system.
- If $\cot\theta = \frac{15}{8}$ and the terminal arm of angle is not in quad I, find the value of $\cos\theta$
- Prove the identity: $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$
- Prove: $\sin(180^\circ + \alpha)\sin(90^\circ - \alpha) = -\sin\alpha\cos\alpha$
- Prove that: $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$

(Turn Over)

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- Prove the identity: $\frac{\sin 2\alpha}{1 + \cos 2\alpha} = \tan \alpha$
- Find the period of $\sec 9x$
- Find the value of side b of the triangle ABC in which $\gamma = 90^\circ$, $\beta = 50^\circ 10'$, $c = 0.832$
- Find any one unknown component of triangle ABC using Law of Sines if $\alpha = 35^\circ 17'$, $\beta = 45^\circ 13'$, $b = 421$
- Find the area of triangle ABC if $a = 524$, $b = 276$, $c = 315$
- Prove that in an equilateral triangle $r : R : r_1 = 1 : 2 : 3$
- Evaluate without using table/calculator $\sin^{-1}\left(-\frac{1}{\sqrt{2}}\right)$
- Solve the trigonometric equation $\operatorname{cosec}^2\theta = \frac{4}{3}$ (only $\operatorname{cosec}\theta = \frac{2}{\sqrt{3}}$)

SECTION – II

- Solve the system of linear equations by Cramer's Rule: $2x_1 + x_2 + x_3 = 8$, $x_1 + 2x_2 + 2x_3 = 6$, $x_1 - 2x_2 - x_3 = 1$ (5)
 - Solve the equations: $x^2 - 3xy + 2y^2 = 0$, $2x^2 - 3x + y^2 = 24$ (5)
- Resolve $\frac{1}{(x-1)^2(x^2+2)}$ into Partial Fractions. (5)
 - If $y = 1 + 2x + 4x^2 + 8x^3 + \dots$, then
 - Show that $x = \frac{y-1}{2y}$ (5)
 - Find the interval in which the series is convergent
- Prove that ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$ (5)
 - 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)
- Find the values of trigonometric function of the quadrantal angle $\frac{407}{2}\pi$ (5)
 - Reduce $\cos^4\theta$ to an expression involving only function of multiple of θ raised to the first power. (5)
- The sides of a triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120° . (5)
 - Prove that $\tan^{-1}\frac{1}{11} + \tan^{-1}\frac{5}{6} = \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{2}$ (5)

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