FBD-11-G1-19

Roll No. : ____________

Objective
Paper Code
6195

Intermediate Part First

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.**

S.#	Questions	A	B	C	D
1	Solution of $1+\cos x = 0$ is:	$\frac{\pi}{2}$	π	2π	$\frac{3\pi}{4}$
2	$\cos^{-1}(-x) =$:	$-\cos^{-1}x$	$\cos^{-1}x$	$\pi-\cos^{-1}x$	$\frac{\pi}{2}-\cos^{-1}x$
3	With usual notation $r_3 =$:	$\frac{\Delta}{s-b}$	$\frac{\Delta}{s-a}$	$\frac{\Delta}{s-c}$	$\Delta^2(s-c)$
4	For a triangle with a, b, c and α, β, γ as measures of sides and opposite angles respectively, then $b^2+c^2-2bc\cos\alpha =$:	a^2	b^2	c^2	Δ^2
5	The period of $\sin\frac{x}{2}$ is:	2π	4π	π	3π
6	$\cos\left(\frac{3\pi}{2}+\theta\right) =$:	$\cos\theta$	$-\cos\theta$	$-\sin\theta$	$\sin\theta$
7	The vertex of an angle in standard form is at:	(1, 0)	(0, 1)	(1, 1)	(0, 0)
8	The sum of odd coefficients in the expansion $(1+x)^n$ is:	n^2	2^{n-1}	2^n	2^{n-2}
9	$n! > n^2$ is true for:	$n < 1$	$n < 2$	$n < 3$	$n \geq 4$
10	With usual notation ^nC_r equals:	$^nC_{r-n}$	^nC_n	$^nC_{n-r}$	$^{n-r}C_n$
11	$0! =$	0	1	-1	2
12	$\sum_{k=1}^{n} k =$	$\frac{n(n+1)}{6}$	$\frac{n(n+1)}{4}$	$\frac{n(n+1)}{2}$	$n(n+1)$
13	If in an A.P, $a_n = \frac{(-1)^{n+1}n}{2n+1}$, then a_4 equals:	4	3	$\frac{4}{3}$	$\frac{-4}{9}$
14	Types of rational fraction are:	3	2	4	1
15	If α, β are the roots of the equation $x^2-4x+5=0$, then $\alpha\beta$ equals:	5	-4	2	4
16	The polynomial ax^3+bx^2+8 has degree:	8	3	$a+b$	5
17	If A and B are non-singular matrices then $(AB)^{-1}$ equals:	$A^{-1}B^{-1}$	$\frac{1}{AB}$	$B^{-1}A^{-1}$	$(BA)^{-1}$
18	If A is a matrix of order 3×2 then A^tA is of order:	3×3	2×3	2×2	3×2
19	The number of subsets of a set of 4-elements is:	16	8	4	6
20	For a, $b\in\mathbb{R}$, either $a>b$ or $a=b$ or $a<b$ is the:	Trichotomy property	Left distributive property	Right distributive property	Cancellation property

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MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

tempt any EIGHT parts: 16

Define irrational numbers.

Name the properties used in these equations: (a) $4 + 9 = 9 + 4$ (b) $1000 \times 1 = 1000$

) Prove that $\bar{z} = z$ iff z is real.

) Write two proper subsets of { a , b , c }

Define order of a set.

) Find the inverse of $\{ (x , y) \mid y = 2x + 3 , x \in \mathbb{R} \}$

) Find x and y if $\begin{bmatrix} x+3 & 1 \\ 3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$

i) If A and B are square matrices of the same order, then explain why in general $(A + B)(A - B) \neq A^2 - B^2$

Define Hermitian matrix.

Prove that $x^3 + y^3 = (x + y)(x + \omega y)(x + \omega^2 y)$

If α, β are the roots of $x^2 - px - p - c = 0$, then prove that $(1 + \alpha)(1 + \beta) = 1 - c$

) Write two properties of the cube roots of unity.

tempt any EIGHT parts: 16

Define conditional equation.

If $\frac{2x+1}{(x-1)(x+2)(x+3)} = \frac{A}{x-1} + \frac{B}{x+2} + \frac{C}{x+3}$ find the value of B.

Write partial fraction form of $\frac{8x^2}{(x^2+1)^2(1-x^2)}$

Find the 7th term of $1 , \frac{3}{2} , \frac{5}{4} , \frac{7}{8} , \ldots\ldots$

Find the number of terms in the A.P if $a_1 = 3$, $d = 7$ and $a_n = 59$

If 5 and 8 are two A.Ms between a and b. Find a and b.

) Find the 9th term of the harmonic sequence $\frac{-1}{5} , \frac{-1}{3} , -1 , \ldots\ldots$

i) If the numbers $\frac{1}{k}$, $\frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k.

How many arrangements of the letters of the word, taken all together, can be made 'PAKPATTAN'.

Use mathematical induction to prove $1 + 3 + 5 + \ldots\ldots + (2n - 1) = n^2$ is true for n = 1 , n = 2

Using binomial theorem find the value of $(1.03)^{\frac{1}{3}}$ upto three decimal places.

) Use binomial theorem to expand $(a - \sqrt{2}\, x)^4$

empt any NINE parts: 18

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Define radian.

Convert $\frac{9\pi}{5}$ to sexagesimal system.

Prove that $\frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

Find the value of tan 15°, without using calculator.

Prove that $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(Continued P . . . . . 2)

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(vi) Prove that $\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

(vii) Find the period of $\cot 8x$

(viii) State the law of sines.

(ix) In the triangle ABC if $\alpha = 35°17'$, $\beta = 45°13'$ and $b = 421$. Find a.

(x) Find the area of the triangle ABC if $a = 200$, $b = 120$, $\gamma = 150°$

(xi) Prove that $\tan^{-1}\frac{1}{4} + \tan^{-1}\frac{1}{5} = \tan^{-1}\frac{9}{19}$

(xii) Solve the equation $4\cos^2 x - 3 = 0$ where $x \in [0, 2\pi]$

(xiii) Solve $\text{cosec}\theta = 2$, where $\theta \in [0, 2\pi]$

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

5. (a) Prove that the set $S = \{1, -1, i, -i\}$ is an abelian group under multiplication. 05

(b) Obtain the sum of all integers in the first 1000 which are neither divisible by 5 nor by 2. 05

6. (a) Show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$ 05

(b) A card is drawn from a deck of 52 playing cards. Find the probability that it is a diamond card or an ace. 05

7. (a) Find the values of a and b if -2 and 2 are the roots of the polynomial $x^3 - 4x^2 + ax + b$ 05

(b) If $y = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \ldots\ldots$, then prove that $y^2 + 2y - 4 = 0$ 05

8. (a) Prove that $\frac{1}{\text{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\text{cosec}\theta + \cot\theta}$ 05

(b) If α, β, γ are angels of ΔABC, then prove that $\tan\alpha + \tan\beta + \tan\gamma = \tan\alpha \ \tan\beta \ \tan\gamma$ 05

9. (a) Prove that $(r_1 + r_2)\tan\frac{\gamma}{2} = c$ 05

(b) Prove that $\sin^{-1}\frac{1}{\sqrt{5}} + \cot^{-1}3 = \frac{\pi}{4}$ 05

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Group-2 FBD-11-G2-19

Roll No. : __________

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6198

Intermediate Part First

MATHEMATICS (Objective) Group – II

Time: 30 Minutes Marks: 20

No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.**

	Questions	A	B	C	D
	A fair coin is tossed twice then probability of getting one head and one tail is:	1	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$
	Arithmetic mean between $2+\sqrt{2}$ and $2-\sqrt{2}$ is:	0	2	4	$2\sqrt{2}$
	If $a_{n-2} = 3n - 11$, then 6th term is:	13	7	15	11
	The partial fractions of $\frac{x+5}{(x+1)(x^2+1)}$ will be of the form:	$\frac{A}{x+1}+\frac{B}{x^2+1}$	$\frac{A}{x+1}+\frac{Bx+C}{x^2+1}$	$\frac{Ax+B}{x+1}+\frac{C}{x^2+1}$	$\frac{A}{x+1}+\frac{Bx}{x^2+1}$
	If ω is cube root of unity then $\omega^{29}+\omega^{28}+1=$:	1	2	0	−1
	If α, β are the roots of $3x^2 - 2x + 4 = 0$ then $(\alpha+1)(\beta+1)=$:	$\frac{3}{4}$	$-\frac{4}{3}$	$\frac{4}{3}$	3
	If $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$ then the value of y will be:	2	−2	4	−4
	If A is 4×4 matrix then $\lvert KA \rvert =$:	$K\lvert A\rvert^4$	$K^2\lvert A\rvert^2$	$K^3\lvert A\rvert$	$K^4\lvert A\rvert$
	If $A \cap B = \varphi$, then $n(A - B)$ is equal to:	$n(A \cup B)$	$n(A \cap B)$	$n(A)$	$n(B)$
0	Multiplicative inverse of (1 , 0) is:	[illegible]	(1 , 0)	(−1 , 0)	(0 , −1)
1	The solution of $1+\cos x = 0$ if $0 \le x \le 2\pi$:	{ 0 }	$\left\{\frac{\pi}{2}\right\}$	$\left\{\frac{\pi}{3}\right\}$	{ π }
2	$\cos(\tan^{-1}\sqrt{3})=$:	$\frac{-1}{2}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\sqrt{3}$
3	If the shadow of a tree is equal to its height then the angle of elevation of the sun is:	45°	30°	60°	90°
4	The period of $3\cos\frac{x}{5}$ is :	π	10 π	$\frac{\pi}{10}$	$\frac{\pi}{5}$
15	$\cos 48° + \cos 12° =$:	2cos18°	3cos18°	$\sqrt{3}\cos 18°$	$\sqrt{2}\cos 18°$
16	$\sqrt{2}\sin 45° + \frac{1}{\sqrt{2}}\csc 45° =$:	1	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	2
17	The number of terms in the expansion of $(x+y)^9$ is :	9	8	10	11
18	If $\sin\theta = \frac{1}{2}$ and $\frac{\pi}{2} < \theta < \pi$ then $\cos\theta =$:	$\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{-1}{2}$
19	Sum of binomial coefficients in the expansion of $(1+x)^5$ is:	32	16	10	8
20	${}^6P_3 =$:	36	6	18	120

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Group-2 FBD-11-G2-19

Intermediate Part First Roll No. ________

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

Attempt any EIGHT parts: 16

i) Simplify by justifying each step: $\dfrac{4+16x}{4}$

ii) Find the multiplicative inverse of the complex number $\left(\sqrt{2}, -\sqrt{5}\right)$

iii) Prove that $\bar{z} = z$ if and only if z is real.

iv) Write any two proper subsets of the set $\{x \mid x \in Q \wedge 0 < x \le 2\}$

v) Write inverse and contrapositive of the conditional $q \to p$

vi) Define a semi-group.

vii) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$

viii) If A and B are square matrices of the same order, then explain why in general $(A+B)(A-B) \neq A^2 - B^2$

ix) Define rank of a matrix.

x) Solve the equation: $x^3 + x^2 + x + 1 = 0$

xi) Discuss the nature of the roots of the equation: $2x^2 - 5x + 1 = 0$

xii) When $x^4 + 2x^3 + kx^2 + 3$ is divided by $x - 2$, the remainder is 1. Find the value of k.

Attempt any EIGHT parts: 16

i) Define an identity equation and give its example.

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

iii) Write in mixed form: $\dfrac{6x^3+5x^2-7}{2x^2-x-1}$

iv) If $\dfrac{1}{a}, \dfrac{1}{b}, \dfrac{1}{c}$ are in A.P. Show that common difference is $\dfrac{a-c}{2ac}$

v) Find the sum of 20 terms of the series, whose rth term is $3r+1$

vi) If x and y are positive distinct real numbers, show that G.M between x and y is less than A.M.

vii) If $y = \dfrac{x}{2} + \dfrac{x^2}{4} + \dfrac{x^3}{8} + \ldots\ldots,\ 0 < x < 2$, prove that $x = \dfrac{2y}{1+y}$

viii) Find the 12th term of harmonic sequence $\dfrac{1}{3}, \dfrac{2}{9}, \dfrac{1}{6}, \ldots\ldots$

ix) Express in factorial form: $\dfrac{(n+1)(n)(n-1)}{3 \cdot 2 \cdot 1}$

x) Prove that $n! > 2^n - 1$ is true for $n = 5, n = 6$

xi) Using binomial theorem find the value of $(1.03)^{\frac{1}{3}}$ upto three decimal places.

xii) Use binomial series to find $(1.03)^{\frac{1}{3}}$ upto three places of decimals.

Attempt any NINE parts: 18

i) Convert 54°45′ into radians.

ii) Evaluate $\dfrac{\tan\frac{\pi}{3} - \tan\frac{\pi}{6}}{1+\tan\frac{\pi}{3}\tan\frac{\pi}{6}}$

iii) Prove that $2\cos^2\theta - 1 = 1 - 2\sin^2\theta$

iv) Prove that $\tan\left(\dfrac{\pi}{4} - \theta\right) + \tan\left(\dfrac{3\pi}{4} + \theta\right) = 0$

v) If α, β, γ are angles of a triangle ABC then prove that $\tan(\alpha + \beta) + \tan\gamma = 0$

(Continued P . . . . . 2)

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(vi) Prove that $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(vii) Find the period of tan 4x

(viii) State the law of cosines (any two).

(ix) At the top of a cliff 80 meters high the angle of depression of a boat is 12°. How far is the boat from the cliff?

(x) Define angle of elevation.

(xi) Show that $\sin(2\cos^{-1}x) = 2x\sqrt{1-x^2}$

(xii) Find solution of equation $\sec x = -2$ which lie in $[0, 2\pi]$

(xiii) Solve the equation $1 + \cos x = 0$

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

(a) If $(G, \times)$ is a group and $a \in G$, then show that inverse of a is unique in G. 05

(b) If ℓ, m, n are the pth, qth and rth terms of an A.P. Show that $p(m-n)+q(n-\ell)+r(\ell-m)=0$ 05

(a) Solve the given system of equations by Cramer's rule:
$$2x + 2y + z = 3$$
$$3x - 2y - 2z = 1$$
$$5x + y - 3z = 2$$
05

(b) Two dice are thrown. What is the probability that the sum of the number of dots appearing on them is 4 or 6? 05

(a) Show that the roots of $x^2+(mx+c)^2=a^2$ will be equal if $c^2=a^2(1+m^2)$ 05

(b) Find the term in the expansion of $\left(\frac{3}{2}x-\frac{1}{3x}\right)^{11}$ involving x^5 05

(a) If $\tan\theta = \frac{1}{\sqrt{7}}$ and the terminal arm of the angle is not in the III quad. Find the value of $\frac{\csc^2\theta-\sec^2\theta}{\csc^2\theta+\sec^2\theta}$ 05

(b) Without using calculator show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$ 05

(a) Prove that $\Delta = 4R\,r\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$ 05

(b) Prove that $\cos^{-1}\frac{63}{65}+2\tan^{-1}\frac{1}{5}=\sin^{-1}\frac{3}{5}$ 05

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