Roll No. : __________

Objective
Paper Code
6191

Intermediate Part First

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

F-SD F-BD-G1-21

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	$(7,9)+(3,-5)=$:	$(7,9)$	$(3,-5)$	$(10,4)$	$(4,10)$
2	Which cannot be used as binary operation?	Addition '+'	Division '÷'	Multiplication '×'	Square root '$\sqrt{\ }$'
3	If adjoint of a matrix $A=\begin{bmatrix}-1 & -2\\ 3 & 4\end{bmatrix}$, then matrix A is:	$\begin{bmatrix}-1 & -2\\ 4 & 3\end{bmatrix}$	$\begin{bmatrix}-4 & 3\\ -2 & 1\end{bmatrix}$	$\begin{bmatrix}4 & 2\\ 3 & -1\end{bmatrix}$	$\begin{bmatrix}4 & 2\\ -3 & -1\end{bmatrix}$
4	Rank of the matrix $\begin{bmatrix}1\\1\\1\\0\end{bmatrix}$ is:	0	1	2	3
5	Which equation has roots 2 and -3 ?	$x^2+x+6=0$	$x^2+x-6=0$	$x^2-x-6=0$	$x^2-x+6=0$
6	If roots of the equation $x^2+px+q=0$ are additive inverse of each other, then which is true?	$p=0$	$q=1$	$p=1$	$p=q$
7	$\frac{x^2+x-1}{Q(x)}$ will be an improper fraction, if:	Degree of $Q(x)=2$	Degree of $Q(x)>2$	Degree of $Q(x)=3$	Degree of $Q(x)\neq 2$
8	Sum of 5 A.Ms between 2 and 8 is:	10	40	25	50
9	If a and b are negative distinct real numbers, then with usual notations, which is correct?	$A>G$	$H<G$	$A<G$	$A>G>H$
10	Which cannot be the term of a G.P. ?	-1	0	1	5
11	A coin is tossed 5 times, then total number of outcomes $n(S)=$:	10	25	20	32
12	2nd term in the expansion of $(1-x)^{-1}$ is:	1	2x	x	$-x$
13	$\sec\theta\cdot\operatorname{cosec}\theta\cdot\sin\theta\cdot\cos\theta=$	1	-1	0	Cannot be determined
14	In a right angled triangle, the side opposite to right angle is called:	Base	Hypotenuse	Perpendicular	Altitude
15	If $\sin\alpha=\frac{2}{3}$, $\cos\alpha=\frac{3}{4}$, then value of $\sin 2\alpha=$:	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{15}{144}$	1
16	Period of $2+\cos 3x$ is:	π	$\frac{3\pi}{2}$	2π	$\frac{2\pi}{3}$
17	In any triangle ABC, $a=4$, $b=10$, $\gamma=30°$, then area of triangle $\Delta=$:	5 sq.units	20 sq.units	10 sq.units	40 sq.units
18	If a, b and c are the sides of a triangle ABC, then $\frac{c^2+b^2-a^2}{2bc}=$:	$\cos\alpha$	$\cos\gamma$	$\cos\beta$	$\cos^2\alpha$
19	If $\sin^{-1}a=0$, then value of a is:	$\frac{\pi}{2}$	π	0	$0\ \&\ \pi$
20	The solution of the equation $2\sin x+\sqrt{3}=0$ in 4th quadrant is:	$\frac{\pi}{3}$	$\frac{5\pi}{3}$	$\frac{-\pi}{4}$	$\frac{-\pi}{6}$

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Intermediate Part First | Roll No. __________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80 FBD-G1-21

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Does the set { 1 , – 1} possess closure property with respect to addition and subtraction?

(ii) Find the difference and product of the complex numbers (8 , 9) and (5 , – 6)

(iii) Find the multiplicative inverse of $(\sqrt{2}\ ,\ -\sqrt{5})$

(iv) If U = { 1, 2, 3, 4, 5, ... , 20 } and A = {1, 3, 5, ... , 19 } verify $A \cup A' = U$

(v) Write the inverse and contrapositive of the conditional $\sim q \rightarrow \ \sim p$

(vi) If a , b are elements of a group G then show that $(ab)^{-1} = b^{-1}a^{-1}$

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

(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) Without expansion verify that $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix} = 0$

(x) Use the remainder theorem to find remainder when first polynomial is divided by second polynomial $x^2+3x+7\ ,\ x+1$

(xi) Find the condition that one root of the equation $x^2+px+q=0$ is multiplicative inverse of the other.

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

3. Attempt any EIGHT parts: 16

(i) Resolve $\dfrac{3x-11}{(x^2+1)(x+3)}$ into partial fractions without finding constants.

(ii) Change $\dfrac{6x^3+5x^2-7}{2x^2-x-1}$ into proper rational fraction.

(iii) Find the indicated term of the sequence 1, – 3, 5, – 7, 9, – 11, ... , a_8

(iv) If $a_{n-3} = 2n-5$ find the nth term of the sequence.

(v) Find the nth term of the geometric sequence if $\dfrac{a_5}{a_3} = \dfrac{4}{9}$ and $a_2 = \dfrac{4}{9}$

(vi) Find A, G, H and verify that A > G > H (G > 0) if a = 2 and b = 8.

(vii) Write n(n – 1)(n – 2) . . . . . (n – r + 1) in factorial form.

(viii) Find the value of n when ${}^{n}P_2 = 30$

(ix) A die is rolled. What is the probability that the dots on the top are greater than 4.

(x) Using binomial theorem expand $(a+2b)^5$.

(xi) Expand $(1-x)^{\frac{1}{2}}$ up to 4 terms.

(xii) Using binomial theorem to find the values of $\sqrt{99}$ to three places of decimals.

4. Attempt any NINE parts: 18

(i) Find ℓ, when $\theta = \pi$ radians , r = 6cm

(ii) Verify $\sin^2\frac{\pi}{6} + \sin^2\frac{\pi}{3} + \tan^2\frac{\pi}{4} = 2$

(iii) Prove that $\sec^2\theta - \operatorname{cosec}^2\theta = \tan^2\theta - \cot^2\theta$

(iv) Without using the table, find the value of sin(–300°)

(v) Prove that $\cos(\alpha + 45^\circ) = \dfrac{1}{\sqrt{2}}(\cos\alpha - \sin\alpha)$

(vi) Prove that $\cot\alpha - \tan\alpha = 2\cot 2\alpha$

(vii) Find the period of $\tan\dfrac{x}{7}$

(viii) Find the greatest angle of triangle ABC if a = 16 , b = 20 , c = 33

(Continued P . . . . . 2)

(ix) Find area of triangle ABC, given sides are $a = 18$, $b = 24$, $c = 30$

(x) Prove that $r_1 r_2 r_3 = rs^2$

(xi) Find the value of $\tan\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$

(xii) Find the solution of the equation $\sin x = \frac{-\sqrt{3}}{2}$ which lies in $[0, 2\pi]$

(xiii) Solve $\cot\theta = \frac{1}{\sqrt{3}}$ where $\theta \in [0, 2\pi]$

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

5. (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) If α, β are the roots of equation $ax^2+bx+c=0$ then form the equation whose roots are $\frac{1}{\alpha^3}, \frac{1}{\beta^3}$ 05

6. (a) Resolve into partial fractions: $\frac{9}{(x+2)^2(x-1)}$ 05

(b) If the H.M and A.M between two numbers are 4 and $\frac{9}{2}$ respectively, find the numbers. 05

7. (a) Prove that: ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^{n}C_r$ 05

(b) Determine the middle term in the expansion of $\left(\frac{1}{x} - \frac{x^2}{2}\right)^{12}$ 05

8. (a) If $\cot\theta = \frac{5}{2}$ and the terminal arm of the angle is in the I-quadrant, find the values of $\frac{3\sin\theta + 4\cos\theta}{\cos\theta - \sin\theta}$ 05

(b) Prove that $\frac{2\sin\theta\sin 2\theta}{\cos\theta + \cos 3\theta} = \tan 2\theta \tan\theta$ 05

9. (a) Show that $\frac{1}{r^2} + \frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} = \frac{a^2+b^2+c^2}{\Delta^2}$ 05

(b) Prove that $2\tan^{-1}\frac{2}{3} = \sin^{-1}\frac{12}{13}$ 05

17-XI121-42000

FBD-G2-21

Roll No. : __________

Objective
Paper Code
6196

Intermediate Part First

MATHEMATICS (Objective) Group – II

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	For any two real numbers a and b, G^2 is equal to:	AH	$\frac{H}{A}$	$\frac{A}{H}$	$\sqrt{AH}$
2	If $\frac{1}{5}$, $\frac{1}{8}$ are two harmonic means between a and b, then value of b is:	$\frac{1}{3}$	$\frac{1}{10}$	$\frac{1}{11}$	$\frac{1}{13}$
3	If $a_n = n + (-1)^n$, then $a_{10} =$:	10	11	9	–11
4	$\frac{P(x)}{x^2+1}$ is proper fraction, if degree of the polynomial P(x) is:	Equal to 2	Greater than 2	Not equal to 2	Less than 2
5	Degree of a constant polynomial is:	1	0	2	Arbitrary
6	If one root of $x^2 + ax + 2 = 0$ is 2, then value of a is:	–3	4	3	– 2
7	If $A = \begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}$, then cofactor of 6 is:	1	– 6	– 1	3
8	The matrix [7] is:	Row matrix	Square matrix	Column matrix	All these
9	If $\sim p \to q$ is a conditional, then its converse is:	$q \to \sim p$	$\sim q \to p$	$p \to \sim q$	$\sim q \to \sim p$
10	If r is the radius and C is the circumference of a circle, then value of $\frac{C}{r} =$:	π	$\frac{\pi}{2}$	2π	$\frac{1}{2\pi}$
11	The solution of equation $\tan x = \frac{1}{\sqrt{3}}$ lies in quadrants:	I & II	I & III	II & IV	I & IV
12	If $x = \sin^{-1}\frac{\sqrt{3}}{2}$, then value of x is:	$\frac{-\pi}{2}$	$\frac{-\pi}{3}$	$\frac{\pi}{3}$	$\frac{\pi}{6}$
13	With usual notations, $\frac{abc}{\Delta} =$:	4R	r	R	rs
14	In any triangle ABC, if two sides and their included angle is given, then area of triangle is:	$\Delta = \frac{1}{2}bc\sin\alpha$	$\frac{1}{2}ab\sin\gamma$	$\Delta = \frac{1}{2}ac\sin\beta$	All these
15	Period of $2\operatorname{cosec}\frac{x}{4}$ is:	$\frac{\pi}{2}$	4π	2π	8π
16	Value of $\sin 7\pi$ is equal to:	1	$\frac{1}{2}$	– 1	0
17	Angle $\frac{5\pi}{9}$ lies in quadrant:	I	III	II	IV
18	If $\ell = 1.5$cm, r = 2.5cm, then value of θ is:	3.75 rad	$\frac{3}{5}$ rad	0.60 rad	$\frac{5}{3}$ rad
19	The 2nd term in the expansion of $(1-2x)^{\frac{1}{3}}$ is:	$-\frac{2}{3}x$	$\frac{2}{3}x$	$\frac{4}{9}x^2$	$\frac{3}{2}x$
20	The number of permutations of the word PANAMA are:	10	60	20	120

18-XI121-12000

Intermediate Part First

Roll No. __________

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours   Marks: 80   FBD-G2-21

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Simplify $(-1)^{\frac{-21}{2}}$

(ii) Show that $z\bar{z} = |z|^2$

(iii) Find multiplicative inverse of $-3-5i$

(iv) Find converse and inverse of $\sim p \rightarrow \sim q$

(v) Write $\{x \mid x \in 0 \wedge 3 < x < 12\}$ in descriptive and tabular form.

(vi) Show that subtraction is non-commutative on 'N'.

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

(viii) Find inverse of $\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$

(ix) Without expansion show that $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix} = 0$

(x) Evaluate $(1+\omega-\omega^2)^8$

(xi) When the polynomial x^3+2x^2+kx+4 is divided by $x-2$, the remainder is 14. Find value of k.

(xii) If α, β are the roots of $3x^2-2x+4=0$, then find the value of $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$

3. Attempt any EIGHT parts: 16

(i) Write only partial fraction form of $\frac{x^2+1}{x^3+1}$ without finding constants.

(ii) Resolve $\frac{7x+5}{(x+3)(x+4)}$ into partial fraction.

(iii) Find the 13th term of the sequence $x, 1, 2-x, 3-2x, \ldots$

(iv) Show that reciprocals of the terms of the geometric sequence $a_1, a_1r^2, a_1r^4, \ldots$ form another geometric sequence.

(v) If $y = 1+\frac{x}{2}+\frac{x^2}{4}+\ldots$ show that $x = 2\left(\frac{y-1}{y}\right)$

(vi) Find the nth term of H.P. $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \ldots$

(vii) Write $\frac{(n+1)(n)(n-1)}{3\cdot2\cdot1}$ in the factorial form.

(viii) Find the value of n when ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$

(ix) Find the number of diagonals of a 6-sided figure.

(x) Prove the formula $1+2+4+\ldots+2^{n-1} = 2^n-1$ for $n = 1, 2$

(xi) Using binomial theorem, expand $(a+2b)^5$

(xii) Expand $(2-3x)^{-2}$ upto 4-terms.

4. Attempt any NINE parts: 18

(i) Find θ when $\ell = 1.5\text{cm}$; $r = 2.5\text{cm}$

(ii) Verify $\sin60^\circ\cos30^\circ - \cos60^\circ\sin30^\circ = \sin30^\circ$

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

(iv) If α, β and γ are the angles of triangle ABC then prove that $\sin(\alpha+\beta) = \sin(\gamma)$

(v) Prove that $\cos(\alpha+45^\circ) = \frac{1}{\sqrt{2}}(\cos\alpha - \sin\alpha)$

(Continued P . . . . . 2)

FBD-G2-21

(vi) Express $2\sin(3\theta)\cos\theta$ as sum or difference.

(vii) Find the period of $\tan\left(\frac{x}{7}\right)$

(viii) Find the value of $\sin 53°40'$

(ix) Find area of triangle ABC, if $a = 200$; $b = 120$ and $\gamma = 150°$

(x) Find the value of α if $a = 7$; $b = 7$, $c = 9$

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

(xii) Solve the equation $\sin x = \frac{1}{2}$

(xiii) Find the solutions of $\cot\theta = \frac{1}{\sqrt{3}}$; $\theta \in [0, 2\pi]$

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

5. (a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$ 05

(b) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots if $c^2 = a^2m^2 + b^2$ 05

6. (a) Resolve into partial fraction: $\frac{1}{(x-1)(2x-1)(3x-1)}$ 05

(b) For what value of n, $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the positive geometric mean between a and b. 05

7. (a) Prove that: ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^{n}C_r$ 05

(b) If $y = \frac{1}{3} + \frac{1.3}{2!}\left(\frac{1}{3}\right)^2 + \frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3 + \ldots\ldots$ then prove that $y^2 + 2y - 2 = 0$ 05

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. 05

(b) Prove without using calculator $\sin 19°\cos 11° + \sin 71°\sin 11° = \frac{1}{2}$ 05

9. (a) Show that $r_3 = 4R\cos\frac{\alpha}{2}\cdot\cos\frac{\beta}{2}\cdot\sin\frac{\gamma}{2}$ 05

(b) Prove that $\sin^{-1}\frac{5}{13} + \sin^{-1}\frac{7}{25} = \cos^{-1}\frac{253}{325}$ 05

18-XI121-12000