PAPER NO. 05 — MULTAN BOARD (FIRST GROUP) — ANNUAL 2018

Roll No. ______________________ (To be filled in by the candidate)

Maximum Marks: 20 **(OBJECTIVE TYPE)** Time Allowed : 30 Minutes

NOTE: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question.

Q1. 20

1. **If $^nC_8 = {}^nC_{12}$, where C stands for combination then value of n is equals to:**
   (A) 4 (B) 20
   (C) 8 (D) 12
2. **The inequality $n^2 > n + 3$ is true for:**
   (A) $n \geq 2$ (B) $n \geq 3$
   (C) $n \geq 0$ (D) $n \geq 1$
3. **The coefficient of the last term in the expansion of $(x - y)^5$ is:**
   (A) −1 (B) 1
   (C) 5 (D) −5
4. **$\sin^2(5\theta) + \cos^2(5\theta) =$ ________**
   (A) 5 (B) 2
   (C) 1 (D) 10
5. **For double angle identities $\sin 2\alpha =$ ________**
   (A) $1 - 2\sin^2\alpha$ (B) $2\sin\alpha\cos\alpha$
   (C) $2\cos^2\alpha - 1$ (D) $\cos^2\alpha - \sin^2\alpha$
6. **The smallest positive number p for which $f(x + p) = f(x)$ is called:**
   (A) Index (B) Domain (C) Coefficients (D) Period
7. **For any triangle ΔABC, with usual notations r_2 is equals to:**
   (A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ (C) $\frac{\Delta}{s-b}$ (D) $\frac{\Delta}{s-c}$
8. **If ΔABC is right angle triangle such that $m\angle\alpha = 90^\circ$, then with usual notations, the true statement is:**
   (A) $a^2 = b^2 + c^2$ (B) $b^2 = a^2 + c^2$
   (C) $c^2 = a^2 + b^2$ (D) $a^2 = b^2 = c^2$
9. **The domain of $y = \sin^{-1} x$ is:**
   (A) $-1 < x < 1$ (B) $-1 \leq x \leq 1$

(C) $-\pi/2 \le x \le \pi/2$ (D) $-\pi/2 < x < \pi/2$

10. If Sin x = $\frac{1}{2}$ then x = ________.

(A) $-\pi/6, 5\pi/6$ (B) $-\pi/6, -5\pi/6$

(C) $\pi/3, 2\pi/3$ (D) $\pi/6, 5\pi/6$

11. If n is prime the $\sqrt{n}$ is:

(A) Rational number (B) Whole number

(C) Natural number (D) Irrational number

12. If a, b $\in$ G, where G is a group then $(ab)^{-1}$ = ________.

(A) $a^{-1}b^{-1}$ (B) $b^{-1}a^{-1}$

(C) $\frac{1}{ab}$ (D) $\frac{-1}{ab}$

13. If $A = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ then co-factor of "4" is:

(A) + 1 (B) − 1

(C) − 4 (D) 3

14. If $A = |a_{ij}|_{3\times3}$, then |KA| = ________.

(A) |A| (B) K|A|

(C) $K^2|A|$ (D) $K^3|A|$

15. If $x^3 + 4x^2 - 2x + 5$ is divided by x − 1 then the remainder is:

(A) 10 (B) −10

(C) 8 (D) −8

16. Nature of the roots of the equation $2x^2 + 5x - 1 = 0$:

(A) Irrational and unequal (B) Rational and equal

(C) Imaginary (D) Rational and unequal

17. The type of rational fraction $\frac{3x^2 - 1}{x - 2}$ is:

(A) Proper (B) Improper

(C) Polynomial (D) Identity

18. In geometric sequence nth term is:

(A) $a_1 + (n-1)d$ (B) $\frac{n}{2}[2a_1 + (n-1)d]$

(C) $\frac{a_1}{1-r}$

(D) $a_1 r^{n-1}$

19. For any series $\sum_{k=1}^{n} K =$ ______

(A) $\frac{n(n+1)(2n+1)}{6}$

(B) $\frac{n(n-1)}{2}$

(C) $\frac{n(n+1)}{2}$

(D) $\frac{n^2(n+1)^2}{4}$

20. For two events A and B if $P(A) = P(B) = \frac{1}{3}$ then probability $P(A \cap B) =$ ______

(A) $\frac{1}{9}$

(B) $\frac{1}{3}$

(C) $\frac{1}{6}$

(D) 1

Multan Board 2018 (First Group)

Roll No. ______________________ **(To be filled in by the candidate)**

Maximum Marks: 80 **(SUBJECTIVE TYPE)** **Time Allowed :2.30 Hours**

PART- 1

Q2. Attempt any eight parts. **(16)**

(i) Write Closure Law and Commutative Law of Multiplication of Real Numbers.

(ii) Show that $z^2 + (\bar{z})^2$ is a real number, $\forall z \in c$.

(iii) Show that $z.\bar{z} = |z|^2$, $z \in c$.

(iv) Define a semi - group.

(v) Write number of elements of sets {a, b} and {{a,b}}.

(vi) If A = {1,2,3,4}, then write a relation in A for {(x, y) / x + y = 5}

(vii) Define Symmetric and Skew Symmetric Matrix.

(viii) If the matrix $\begin{bmatrix} 4 & \lambda & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ is symmetric, then find value of λ.

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

(x) Solve $x^{1/2} - x^{1/4} - 6 = 0$

(xi) Show that the polynomial $(x - 1)$ is a factor of polynomial $x^2 + 4x - 5$ by using factor theorem.

(xii) Discuss nature of roots of equation $x^2 + 2x + 3 = 0$.

Q3. Attempt any eight parts.

(i) Resolve $\frac{1}{x^2 - 1}$ into partial fractions.

(ii) Write the first four terms of the sequence, if $a_n = (-1)^n n^2$.

(iii) How many terms of the series $-7 + (-5) + (-3) +$ _______ amount to 65?

(iv) Find the geometric mean between $-2i$ and $8i$.

(v) Find the sum of the infinite geometric series $4 + 2\sqrt{2} + 2 + \sqrt{2} + 1 +$ ______.

(vi) Write two important relations between arithmetic, geometric and harmonic means.

(vii) Write the following in factorial form $(n + 2)(n + 1)(n)$

(viii) Find the value of n, when ${}^{n}C_{12} = {}^{n}C_{6}$.

(ix) A die is rolled. Find the probability that top shows 3 or 4 dots.

(ix) A die is rolled. Find the probability that top shows 3 or 4 dots.

(x) Use mathematical induction to verify for n = 1, 2 $1+\frac{1}{2}+\frac{1}{4}+ \_\_\_\_\_\_ + \frac{1}{2^{n-1}} = 2\left[1-\frac{1}{2^n}\right]$

(xi) Calculate $(9.98)^4$ by means of binomial theorem.

(xii) Expand $\frac{\sqrt{1+2x}}{1-x}$ up to 4 – terms, taking the values of x such that the expansion in each case is valid.

Q4. Attempt any nine parts. **(18)**

(i) Convert the angle 54° 45' into radians.

(ii) Find r, when l = 56cm θ = 45° in a circle.

(iii) Prove that $\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta} = 2\sec^2\theta$

(iv) If Cas a = $\alpha = \frac{3}{5}$, find the the value of Cot α, where $0 < \alpha < \frac{\pi}{2}$.

(v) If α, β, γ are angles of a triangle ΔABC, then prove that Sin (α + β) = Sinγ

(vi) Prove that $\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$.

(vii) Find the period of $\tan\frac{x}{3}$.

(viii) State the Law of Cosines.

(ix) Find the area of ΔABC with a = 200, b = 120 included angle γ = 150°.

(x) Find R if a = 13, b = 14, c = 15 are the sides of triangle ΔABC.

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

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

(xiii) Solve Sinx + Cos x = 0

PART - II

Note: Attempt any THREE questions.

Q5. (a) Prove that all non-singular matrices of order 2 × 2 over real field form a non-abelian group under multiplication. **5**

(b) Find the value of λ for which the following system does not possess a unique solution. Also solve the system for the value of λ. **5**

$x_1 + 4x_2 + \lambda x_3 = 2$, $2x_1 + x_2 - 2x_3 = 11$, $3x_1 + 2x_2 - 2x_3 = 16$

Q6. (a) Show that the roots of the equatino $x^2 - 2\left(m+\frac{1}{m}\right)x + 3 = 0$, m ≠ 0, are real. **5**

(b) Resolve $\frac{x^4}{1-x^4}$ into partial fraction. **5**

Q7. (a) Sum the series: $\frac{1}{1+\sqrt{x}}+\frac{1}{1-x}+\frac{1}{1-\sqrt{x}}+ \_\_\_\_\_\_$ to n terms. **5**

(b) Determine the middle terms in the expansion of $\left(\frac{3}{2}x-\frac{1}{3x}\right)^{11}$ 5

Q8. (a) Prove the following identity: $\sin^6\theta-\cos^6\theta=(\sin^2\theta-\cos^2\theta)(1-\sin^2\theta\cos^2\theta)$. 5

(b) Prove that: $\frac{\sin\theta+\sin3\theta+\sin5\theta+\sin7\theta}{\cos\theta+\cos3\theta+\cos5\theta+\cos7\theta}=\tan4\theta$ 5

Q9. (a) Prove that $(r_1+r_2)\tan\frac{\gamma}{2}=c$ (with usual notations). 5

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

PAPER NO. 06 — MULTAN BOARD (SECOND GROUP) — ANNUAL 2018

Roll No. ______________________ (To be filled in by the candidate)

Maximum Marks: 20 **(OBJECTIVE TYPE)** Time Allowed : 30 Minutes

NOTE: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question.

Q1. 20

1. In any triangle ΔABC, with usual notation, $\sqrt{\frac{s(s-c)}{ab}}$ is equal to:

(A) $\sin\frac{\gamma}{2}$ (B) $\cos\frac{\gamma}{2}$

(C) $\sin\frac{\alpha}{2}$ (D) $\cos\frac{\alpha}{2}$

2. In a right angle triangle no angle is greater than:

(A) 90° (B) 30°

(C) 45° (D) 60°

3. The value of $\sin^{-1}\left(\cos\frac{\pi}{6}\right)$ is equal to:

(A) $\frac{\pi}{2}$ (B) $\frac{3\pi}{2}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{3}$

4. If $\sin x = \frac{1}{2}$ then x is equal to:

(A) $\frac{\pi}{6}, \frac{5\pi}{6}$ (B) $\frac{-\pi}{6}, \frac{-5\pi}{6}$

(C) $\frac{-\pi}{6}$ (D) $\frac{-5\pi}{6}$

5. Multiplicative inverse of complex number $(\sqrt{2}, -\sqrt{5})$ is:

(A) $\left(\frac{\sqrt{2}}{\sqrt{7}}, \frac{\sqrt{5}}{\sqrt{7}}\right)$ (B) $\left(\frac{-\sqrt{2}}{\sqrt{7}}, \frac{-\sqrt{5}}{\sqrt{7}}\right)$

(C) $\left(\frac{\sqrt{2}}{7}, \frac{\sqrt{5}}{7}\right)$ (D) $\left(\frac{\sqrt{2}}{7}, \frac{\sqrt{5}}{7}\right)$

6. If A, B are two sets then $A \cap (A \cup B)$ equals:

(A) A (B) $A \cup B$ (C) B (D) ϕ

7. A square matrix A is called skew symmetric if $A^t =$ ________.

(A) A (B) $\overline{A}$ (C) $-A^t$ (D) $-A$

8. If $\begin{vmatrix} 2 & \lambda \\ 3 & 7 \end{vmatrix} = 2$, then $\lambda =$ ________.

(A) 1 (B) 2 (C) 3 (D) 4

9. **A reciprocal equation, remains unchanged when variable x is replaced by:**

(A) $\frac{-1}{x}$ (B) $\frac{1}{x^2}$

(C) $-x$ (D) $\frac{1}{x}$

10. **$f(x) = 3x^4 + 4x^3 + x - 5$ is divided by $x + 1$ then remainder is:**

(A) -6 (B) 7

(C) 6 (D) -7

11. **Types of rational fractions are:**

(A) Two (B) Three

(C) Four (D) Infinite

12. **Harmonic Mean between a and b is:**

(A) $\frac{ab}{a+b}$ (B) $\frac{a+b}{ab}$

(C) $\frac{2ab}{a+b}$ (D) $\frac{a-b}{ab}$

13. **If $a = -1$ and $b = 5$ then $A \times H$ is equal to: (where A = A.M and H = H.M)**

(A) -5 (B) $\frac{-5}{2}$

(C) 5 (D) $\frac{2}{5}$

14. **${}^nC_{r-1} + {}^nC_{r-2}$ is equal to: (where C is combination)**

(A) ${}^nC_{r-1}$ (B) ${}^{n+1}C_{r-1}$

(C) ${}^{n+1}C_{r-2}$ (D) ${}^nC_{r-2}$

15. **The value of n when ${}^{11}P_n = 11 \times 10 \times 9$ is: (where P is permutation)**

(A) 0 (B) 1

(C) 2 (D) 3

16. **In the expansion of $(3 + x)^4$ middle term will be:**

(A) 81 (B) $54x^2$

(C) $26x^2$ (D) x^4

17. **The inequality $4^n > 3^n + 4$ is valid if n is:**

(A) $n = 2$ (B) $n = 1$

(C) $n = -1$ (D) $n = -2$

18. The angle $\frac{\pi}{12}$ is degree measure is:

(A) 30°
(B) 20°
(C) 45°
(D) 15°

19. $\tan(\pi - \alpha)$ equals:

(A) $\tan\alpha$
(B) $-\tan\alpha$
(C) $\cot\alpha$
(D) $-\cot\alpha$

20. Period of cot 8x is:

(A) $\frac{\pi}{8}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{2}$
(D) π

Multan Board 2018 (Second Group)

Roll No. ______________________ (To be filled in by the candidate)

Maximum Marks: 80 **(SUBJECTIVE TYPE)** Time Allowed :2.30 Hours

PART-1

Q2. Attempt any eight parts. **(16)**

(i) Prove that $\frac{7}{12}-\frac{5}{18}=\frac{21-10}{36}$ by justifying each step. (writing each property)

(ii) Simplify the following $(5,-4)\div(-3,-8)$

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

(iv) Write two proper subsets of the set of real numbers R.

(v) Construct truth table for the following $(p\wedge\sim p)\rightarrow q$

(vi) For a set $A=\{1,2,3,4\}$, find the relation $R=\{(x,y)/x+y<5\}$ in A. Also state the domain of R.

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

(viii) If $A=[a_{ij}]_{3\times4}$, then show that $I_3 A=A$

(ix) Without expansion show that $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}=0$.

(x) Solve the following equation by factorization $x(x+7)=(2x-1)(x+4)$

(xi) Show that $x^3-y^3=(x-y)(x-\omega y)(x-\omega^2 y)$, where ω is a cube root of unity.

(xii) Use remainder theorem to find the remainder, when x^2+3x+7 is divided by $x+1$.

Q3. Attempt any eight parts. **(16)**

(i) Define a Partial Fraction.

(ii) If $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in arithmetic progression, show that $b=\frac{2ac}{a+c}$

(iii) Find the arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$

(iv) If the series $y=\frac{x}{2}+\frac{x^2}{4}+\frac{x^3}{8}+$ ______ ∞ and $0<x<2$. Then prove that $x=\frac{2y}{1+y}$

(v) If 5 is Harmonic mean between "2" and "b". Find "b".

(vi) Prove that $\sum_{k=1}^{n} k=\frac{n(n+1)}{2}$

(vii) How many 5 digits multiples of "5" can be formed from the digits 2, 3, 5, 7, 9 when no digit to be repeated?

(viii) Find n if ${}^nC_5 = {}^nC_4$ (C is used for combination)

(ix) What is the probability that a slip of numbers divisible by 4 is picked from slips bearing numbers 1, 2, 3, ..., 10?

(x) Use Binomial Theorem, find $(21)^5$.

(xi) Expand up to four terms $(8-2x)^{-1}$.

(xii) If x be so small that its square and higher powers can be neglected. Then prove $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1+\frac{3x}{2}$

Q4. Attempt any nine parts. (18)

(i) Find "ℓ" (arc length) when $r = 18mm$ and $\theta = 65^\circ 20'$.

(ii) If $\sec\theta < 0$ and $\sin\theta < 0$, in which quadrant terminal arm of 'θ' lies.

(iii) Show that $\sin^2\frac{\pi}{6}+\sin^2\frac{\pi}{3}+\tan^2\frac{\pi}{4}=2$

(iv) Prove that $\sin(180^\circ+\theta)\sin(90^\circ-\theta) = -\sin\theta\cos\theta$

(v) Find the value of $\sin 15^\circ$

(vi) Prove that $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

(vii) Find the period of $\cos \frac{x}{6}$

(viii) In a right ΔABC, if $b = 30.8$, $c = 37.2$ and $\gamma = 90^\circ$. Find α and β

(ix) Find the area of ΔABC in which $b = 21.6$, $c = 30.2$ and $\alpha = 52^\circ 40'$.

(x) Define "Inscribed Circle".

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

(xii) Solve the equation $\sin x = \frac{1}{2}$ where $x \in [0, 2\pi]$

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

PART - II

Note: Attempt any THREE questions.

Q5. (a) Show that the set {1,ω,ω2}, (where $w^3=1$), is an abelian group w.r.t. ordinary multiplication. 5

(b) Without expansion verify that $\begin{vmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{vmatrix} = 0$ 5

Q6. (a) Resolve $\frac{x^2+1}{x^3+1}$ into Partial Fraction. 5

(b) Solve the equation $\sqrt{3x^2-7x-30}-\sqrt{2x^2-7x-5} = x-5$ 5

Q7. (a) Find the value of n so that $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ may be the Arithmetic Mean between a and b. 5

(b) Use mathematical induction to prove that the following formula holds for every positive integer "n". $\frac{1}{2\times5}+\frac{1}{5\times8}+\frac{1}{8\times11}+ \text{———} +\frac{1}{(3n-1)(3n+2)}=\frac{n}{2(3n+2)}$ 5

Q8. (a) Prove the $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$ 5

(b) Prove that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9}=\frac{3}{16}$ 5

Q9. (a) The sides of a triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$. 5

Prove that the greatest angle of the triangle is 120°.

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