UNIVERSITY OF THE PUNJAB

Third Semester – 2019
Examination: B.S. 4 Years Program

Roll No. in Fig. ....

Roll No. in Words. ....

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Signature of Supdt.:

PAPER: Pure Mathematics

Course Code: MATH-222/MTH-21119 Part–I (Compulsory)

MAX. TIME: 30 Min.

MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.
Please encircle the correct option. Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. **Encircle the right answer, cutting and overwriting is not allowed.**   **(1x10=10)**

i) $A \cap A^c =$

    a) A b) A^c c) ϕ d) 0

ii)   A set consists of those elements which belong to A or B but not to both is denoted by

    a) $A \oplus B$ b) $A \cap B$ c) $A \cup B$ d) A/B

iii)   A subset of a metric space is said to be closed if it contains all of its

    a) Unions   b) Intersections   c) products   d) limit points

iv)   A function $f: N \to N$ defined by $f(n) = 2n$ is

    a) one-to-one   b) onto   c) neither 1-1 nor onto   d) none of these

v)   Which of the following is proposition?

    a) Do not smoke   b) Lahore is capital of Punjab   c) $x + y = z$ d) walk along the road

vi)   The A.M between $3\sqrt{5}$ and $5\sqrt{5}$ is

    a) $\sqrt{5}$ b) $2\sqrt{5}$ c) $3\sqrt{5}$ d) $4\sqrt{5}$

vii)   The converse of $p \to q$ is

    a) $q \to p$ b) $\sim p \to \sim q$ c) $\sim q \to \sim p$ d) $p \leftrightarrow q$

viii)   The 13th term of the sequence $x, 1, 2 - x, ...$ is

    a) $10 - 9x$ b) $11 - 10x$ c) $12 - 11x$

ix)   For two sets A and B, $A - B =$

    a) $A \cup B^c$ b) $A^c \cup B$ c) $A \cap B^c$ d) $A^c \cap B$

x)   If $Q(x,y): y = x^2 + 2$, then which is true

    a) $Q(1,2)$ b) $Q(2,1)$ c) $Q(1,3)$ d) $Q(3,1)$

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Third Semester – 2019

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Roll No. ....

PAPER: Pure Mathematics

Course Code: MATH-222/MTH-21119   Part – II

MAX. TIME: 2 Hrs. 30 Min.

MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2.   **Answer the following short questions.**   **(10 x 2 = 20)**

i.   Find the unit open ball in R^2.

ii.   If A and B are subsets of a universal set U, then show that $A \subseteq B$ iff $B^c \subseteq A^c$.

iii.   Determine whether the function $f(x) = 7 - 3x^2$ is bijective from R to R.

iv.   Find the closures of Q and Q^c in R.

v.   Define absurdity with suitable example.

vi.   Find $g \circ f$, where $f(x) = x^2 + 1$ and $g(x) = x - 1$.

vii.   Find the first three terms of a sequence if $a_n - a_{n-1} = n + 1$ and $a_4 = 14$.

viii.   List the ordered pairs in the relation on $\{1,2,3\}$ corresponding to the matrix $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$.

ix.   Find the domain and sketch the function $f(x) = \frac{x-1}{x^2}$.

x.   Which term of A.P. $5, 2, -1, \ldots$ is -85?

Answer the following long questions.   **(5 x 6 = 30)**

Q. 3   Illustrate the distributive law $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ with Venn diagrams.   [6]

Q. 4   Prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$, when $A, B, A \cup B$ and $A \cap B$ are finite sets.   [6]

Q. 5   Show that the function $d: R \times R \to R$ defined by $d(x,y) = \sqrt{|x - y|}, \forall x, y \in R$ is a metric on R.   [6]

Q. 6   Determine the validity of the argument: $p \to \sim q, r \to q, r \vdash \sim p$.   [6]

Q. 7   Show that $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$ for all positive integers n.   [6]