UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. .....

Roll No. in Words. .....

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Signature of Supdt.:

PAPER: Set Theory **MAX. TIME: 30 Min.**

Course Code: MATH-401 Part–I (Compulsory) **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 MCQs (1 Mark each)

(i) An ordered set S is said to be well ordered if every subset of S contains ---------- element.

(a) maximal (b) minimal (c) first (d) last

(ii) Let $A=\{a,b\}, B=\{x,y,z\}$ then cardinality of A^B is ----------

(a) 6 (b) 8 (c) 9 (d) 5

(iii) Let $I_k=\left(\frac{-1}{k},\frac{1}{k}\right)$, then $\bigcap_{k=1}^{\infty} I_k =$ ----------

(a) 0 (b) ϕ (c) $\{0\}$ (d) $(-\infty,\infty)$

(iv) The bijective mapping $f:[0,1]\to[a,b]$ is defined by ----------

(a) $f(x)=ax+b$ (b) $f(x)=a+bx$

(c) $f(x)=(b-a)x+a$ (d) $f(x)=(a+b)x+b$

(v) A set S is said to be ---------- if it has the same cardinality as a proper subset of itself.

(a) finite (b) infinite (c) countable (d) uncountable

(vi) Let S be a partially ordered set. An element $a\in S$ is called minimal element of S -------- if

(a) $x\le a\ \forall x\in S$ (b) $x\le a$ implies $x=a$

(c) $x\ge a$ implies $x=a$ (d) $x\ge a\ \forall x\in S$

(vii) Every element in a Well-ordered set has a unique immediate successor except the ---------- element

(a) first (b) last (c) minimal (d) maximal

(viii) Let $Z=\{...,-3,-2,-1,0,1,2,3,...\}$ then the initial segment $s(0)=$ ---------

(a) $\{1,2,3,...,10\}$ (b) $\{...,-3,-2,-1\}$ (c) $\{...,-3,-2,-1,0\}$ (d) None of these

(ix) Let a and b are elements of partially ordered set S. We say a and b are ----------

if $a<b$ or $b>a$ (i.e. if one of them precedes other).

(a) Non comparable (b) Comparable (c) minimal (d) Maximal

(x) Let $N=\{1,2,3,...\}$ and $M(a)=\{x:x\ge a\}$ then $M(9)=$ ---------

(a) $\{1,2,3,...,9\}$ (b) $\{9,10,11,...\}$ (c) $\{10,11,12,...\}$ (d) None of these

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Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. .....

PAPER: Set Theory **MAX. TIME: 2 Hrs. 30 Min.**

Course Code: MATH-401 Part – II **MAX. MARKS: 50**

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q. 2 SHORT QUESTIONS

(i) Prove that a well-ordered set cannot be similar to one of its initial segments. (4)

(ii) Suppose A and B are ordered sets. Show that the product order on $A \times B$, defined by (4)

$(a, b) \leq (c, d)$, if $a \leq c$ and $b \leq d$ is a partial ordering of $A \times B$.

(iii) Prove that $\mathbb{N} \times \mathbb{N}$ is denumerable and deduce that $\aleph_0 . \aleph_0 = \aleph_0$. (4)

(iv) Let $A = \{1,2,3,4,6,8,9,12,18,24\}$ with Order xRy defined by x divides y. Show that (4)
it is a Partial order relation, also find the Minimal and Maximal elements.

(v) Prove that $R^2 \approx R$ and, more generally, that $R^n \approx R$, where '$\approx$' mean equipotent. (4)

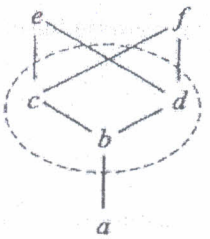
SECTION-III

LONG QUESTIONS

Q.3 State and Prove the Cantor's Theorem for cardinal numbers. (6)

Q.4 Let A and B the two ordered sets and $f : A \to B$ be a similarty mapping then a (6)
belongs to A is first or (last) element of A ifand only if $f(a)$ is first or (last) element
of B.

Q.5 Let $X = \{a, b, c, d, e, f\}$ be ordered as shown in the figure (6)
and $A = \{b, c, d\}$ be a subset of X. Find minimal and
maximal element of X. Also find $Sup(A)$ and $Inf(A)$ in X.



Q.6 Every element in a well ordered set A has a unique immediate successor except the last (6)
element.

Q.7 Define Zorn's Lemma and show that every vector space V admits a basis. (6)