Staple!

Ord: ___ ___

Sets and Logic
MHF3202 17HE

Class-B

Prof. JLF King
Wednesday, 26Oct2022

B4: Short answer. Show no work. Write LARGE.

Write **DNE** if the object does not exist or the operation cannot be performed. NB: DNE $\neq \{\} \neq 0$.

___ ___ **a** For a LOR (letter-of-recommendation), Prof. K requires two courses, or a Special Topics or graduate course Circle:

Yes **True** **Darn tootin'!**

___ ___ **b** Mimicking what we did in class: From the 987×200 game-board, cut-out (remove) the $(35, 150)$-cell and one other cell at $P = (x, y)$. Circle those choices for P,

$(150, 160)$, $(14, 35)$, $(66, 77)$, $(195, 15)$, $(123, 4)$

which, if removed, would leave a board that *definitely* can**not** be domino-tiled.

___ ___ **c** Both $\sim$ and $\bowtie$ are equiv-relations on a set Ω. Define binrels $\mathbf{I}$ and $\mathbf{U}$ on Ω as follows.

Define $\omega \,\mathbf{U}\, \lambda$ IFF *Either* $\omega \sim \lambda$ *or* $\omega \bowtie \lambda$ [or both].

Define $\omega \,\mathbf{I}\, \lambda$ IFF *Both* $\omega \sim \lambda$ *and* $\omega \bowtie \lambda$.

So "**U** *is an equiv-relation*" is: *T* *F*

So "**I** *is an equiv-relation*" is: *T* *F*

___ ___ **d** Let $\boldsymbol{\delta}_N$ be the number of derangements of $[1 .. N]$, and $P_N := \frac{\boldsymbol{\delta}_N}{N!}$ the probability that an N-perm is a derangement. Written in Incl-Excl notation (the formula we derived in class), $\boldsymbol{\delta}_{17} =$ ....

Limit $\left[\lim_{N\to\infty} P_N\right]$ equals ....

___ ___ **e** On a 4-set, there are .... many equivalence relations.

___ ___ **f** Let $\mathcal{P}_\infty$ denote the family of all *infinite* subsets of $\mathbb{N}$. Define relation $\approx$ on $\mathcal{P}_\infty$ by: $A \approx B$ IFF $A \cap B$ is infinite.

Stmt "*This* $\approx$ *is an equivalence-relation*" is: *T* *F*

OYOP: *In grammatical English* ***sentences****, write your essay on every* 2nd *line* (usually)*, so I can easily write between the lines.*

B5: Consider a strict well-order $\prec$ on set $\mathbf{U}$, and and a strict well-order $<$ on $\mathbf{\Gamma}$. Define binrel $\ll$ on $\mathbf{U}\times\mathbf{\Gamma}$ by:

$$(b, \alpha) \ll (c, \beta)$$

IFF *Either* $b \prec c$ *or* $[b = c$ and $\alpha < \beta]$.

Prove: *Relation* $\ll$ *is a well-order on* $\mathbf{U}\times\mathbf{\Gamma}$.

B4:	___ ___ ___	105pts
B5:	___ ___	40pts
Total:	___ ___ ___	145pts

NAME: ....

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor or TA."*

Signature: ....