

Exam details

3 hours, attempt all 6 questions

- Q1 }
Q2 } Semester I material
Q3 } see MA185 Christmas paper
on my web page
- Q4 knights, knows, Truth tables
valid/invalid arguments
equiv. relations, partitions
- Q5 Express permutation as product
of transpositions. Find order,
sign of permutation.
Quotient & remainder of
 $f(x), g(x) \in \mathbb{Z}_7[x]$.
Irreducible factors of
 $x^3 + ax^2 + bx + c \in \mathbb{Z}_{13}[x]$.
- Q6 Principle of induction. Prove something.
Characteristic polynomial,
eigenvalues/vectors of 3×3 matrix.

Problem You visit the island of knights & knaves, where knights always tell truth and knaves always lie. Three inhabitants A, B, C made following statements:

A says: B and C are both knaves

B says: C is a knave

C says: both A and I are knights

Who, if anyone, is telling the truth.

A	B	C	statement of A	statement of B	statement of C
T	T	T	F		
T	T	F	F		
T	F	T	F		
T	F	F	F	F	
F	T	T	T	T	
F	T	F	F	T	F ←←
F	F	T	F	F	F
F	F	F	T		

conclude from line 6 that B is the only one telling the truth.

1) the following argument valid:

if he get a Christmas bonus he will
buy a new mountain bike, if he
sell my old car he will buy
a mountain bike, he sell my
old car or he get a Christmas
bonus. Therefore he will get a
new mountain bike.

B: he gets a Christ mas house
#merry biker

B: I get a mountain bike
M: I get a ~~new~~ mountain bike
M: I get an old car

M: h g
S: h sell very old car
h it a

S: In semantics
The argument is valid if and only if
the following proposition is always
true.

$$\{ (B \rightarrow M) \wedge (S \rightarrow M) \wedge (S \vee B) \} \rightarrow M$$

B	M	S	$B \rightarrow M$	$S \rightarrow M$	$S \vee B$	X	$X \rightarrow M$
T	T	T	T	T	T	T	T
T	T	F	T	T	T	T	T
T	F	T	F	F	T	F	T
F	T	T	T	T	T	T	T
T	F	F	F	F	T	F	T
F	T	F	T	T	F	T	T
F	F	T	T	F	T	F	T
F	F	F	T	T	F	F	T

Since $X \rightarrow M$ is always true, the argument is valid.