| Stude | ent ID: | | Duration: 15 mins | Date: 11/04/2023 | |
|--------------|-----------------------------|---|----------------------------------|--------------------------------------|--|
| Stude | ent name: | | | Score:/_3 | |
| the su | ibstitution θ | Find the MGU for each of the follow . Otherwise, write No MGU and justi), G(x, w)) and P(A, F(w, B), G(w, x) | fy your answer. | | |
| b. | P(x, F(x), A | A, A) and P(y, F(A), y) | where A is a constant sym | ıbol | |
| | |) Translate the following sentences | from English to First-order log | ic. | |
| No. | Score (pt) | Sentence | | | |
| 1 | 0.25 | Brioche is a creamy bun, yet it doe | | | |
| 2 | 0.25 | Every bun is sold in some conveni | | | |
| 3 | 0.25 | Some convenience stores do not so | 0 00 | | |
| 4 | 0.25 | No convenience store sells all buns | | | |
| 5 | 0.5 | Only one convenience store sells E | | | |
| 6 | 0.5 | Some buns are either creamy or ha | as eggs (but not both at the san | ne time). | |
| using • • 1. | Store(x): x Sells(x, y): | en predicates is a convenience store x sells y • Brioch | he is a constant • Egg(x | ny(x): x is creamy): x has eggs. | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| | | | | | |

| Stude | ent ID: | | Duration: | Duration: 15 mins | | | | |
|--------|----------------------|--|----------------------------|------------------------------|-------------------------|--|--|--|
| Stude | ent name: | | | | | | | |
| the su | ubstitution θ | Find the MGU for each of the Otherwise, write No MGU and O | | | | | | |
| b. | Q(A, x, F(G | (y))) and Q(z, F(z), F(u)) | where A is a cor | where A is a constant symbol | | | | |
| Ques | tion 2 (2pts |) Translate the following ser | ntences from English to Fi | rst-order log | ic. | | | |
| No. | Score (pt) | Sentence | | | | | | |
| 1 | 0.25 | Baozi is a tasty bun, and it i | is not salty. | | | | | |
| 2 | 0.25 | Every bun contains some e | ggs. | | | | | |
| 3 | 0.25 | Some buns do not contain s | salty eggs. | | | | | |
| 4 | 0.25 | No egg is contained in all b | uns. | | | | | |
| 5 | 0.5 | Baozi bun contains at least | | | | | | |
| 6 | 0.5 | Every egg is either tasty or salty (but not both simultaneously). | | | | | | |
| using | only the giv | en predicates | | | | | | |
| • | Bun(x): x i | - | sty(x): x is tasty | • Conta | ins(x, y): x contains y | | | |
| • | Baozi is a | | lty(x): x is salty | |): x is an egg | | | |
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| | | | | | | | | |
| 3. | | | | | | | | |
| 4. | | | | | | | | |
| 5. | | | | | | | | |
| Э. | •••••• | | | | | | | |
| | | | | | | | | |
| 6. | | | | | | | | |
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| | | | | 4 | | | | |
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| Student name: Score: | Stude | ent ID: | | Dura | ation: 15 r | nins | Date: 11/0 | 4/2023 |
|--|--------|-------------------------------------|------------------------------------|--------------------------|--------------|-------------|---------------|----------|
| the substitution 0. Otherwise, write No MGU and justify your answer. a. R(x,y,z) and R(u, H(v,v), u) b. R(A, x, F(x)) and R(A, y, y) where A is a constant symbol Question 2 (2pts) Translate the following sentences from English to First-order logic. No. Score (pt) Sentence 1 0.25 Baguette is not a brown bread, and it is bad for diet. 2 0.25 Each shop sells some bread. 3 0.25 Some shop sells no brown bread. 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop • Sells(x, y): x sells y 1. 2. 3. 4. 5. | Stude | ent name: | | | | | Score: | / 3 |
| b. R(A, x, F(x)) and R(A, y, y) where A is a constant symbol Question 2 (2pts) Translate the following sentences from English to First-order logic. No. Score (pt) Sentence 1 0.25 Baguette is not a brown bread, and it is bad for diet. 2 0.25 Each shop sells some bread. 3 0.25 Some shop sells no brown bread. 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop • Baguette is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. 5. | the su | ibstitution θ . R(x, y, z) a | Otherwise, write No MGU | J and justify your answ | ver. | | s such an MGl | J, write |
| No. Score (pt) Sentence 1 0.25 Baguette is not a brown bread, and it is bad for diet. 2 0.25 Each shop sells some bread. 3 0.25 Some shop sells no brown bread. 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop sells. • Baguette is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. 5. | b. | | | | | | mbol | |
| 1 0.25 Baguette is not a brown bread, and it is bad for diet. 2 0.25 Each shop sells some bread. 3 0.25 Some shop sells no brown bread. 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop bread(x): x is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. 5. | Ques | tion 2 (2pts |) Translate the following s | sentences from English | n to First-c | order logic | | |
| 2 0.25 Each shop sells some bread. 3 0.25 Some shop sells no brown bread. 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop ender the sells of th | No. | Score (pt) | Sentence | | | | | |
| 3 0.25 | 1 | 0.25 | Baguette is not a brown | bread, and it is bad for | diet. | | | |
| 4 0.25 There is no bread that all shop sells. 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop • Baguette is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. | 2 | 0.25 | Each shop sells some bro | ead. | | | | |
| 5 0.5 There is exactly one bread that is good for diet. 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop • Sells(x, y): x sells y 1 | 3 | 0.25 | Some shop sells no brow | n bread. | | | | |
| 6 0.5 Each bread is brown or bad for diet (but both at different times). using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Shop(x): x is a bakery shop • Baguette is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. 5. | 4 | 0.25 | There is no bread that al | l shop sells. | | | | |
| using only the given predicates • Bread(x): x is a bread • Brown(x): x is brown • Baguette is a constant • Diet(x): x is good for diet • Sells(x, y): x sells y 1. 2. 3. 4. 5. | 5 | 0.5 | There is exactly one brea | ad that is good for diet | | | | |
| Bread(x): x is a bread Brown(x): x is brown Shop(x): x is a bakery shope Sells(x, y): x sells y 1. 2. 3. 4. 5. | 6 | 0.5 | Each bread is brown or b | oad for diet (but both a | at differen | t times). | | |
| Bread(x): x is a bread Brown(x): x is brown Shop(x): x is a bakery shope Sells(x, y): x sells y 1. 2. 3. 4. 5. | using | only the give | en predicates | | | | | |
| Baguette is a constant Diet(x): x is good for diet Sells(x, y): x sells y | • | - | - | rown(x): x is brown | • | Shop(x): | x is a bakery | shop |
| 2. 3. 4. 5. | • | | | • • | | | - | • |
| 2. 3. 4. 5. | 1. | _ | | | | | | |
| 4. 5. | 2. | | | | | | | |
| 5. | 3. | ••••• | | | | | | |
| | 4. | | | | | | | |
| 6. | 5. | | | | | | | |
| 6 | | | | | | | | |
| | 6. | | | | | | | |
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| Student ID: | | | Duration: 15 mins | Date: 11/04/2023 | | |
|-------------|-------------------------------|---|------------------------------------|---|--|--|
| Stude | nt name: | | | Score:/ <u>3</u> | | |
| the su | ibstitution 6 | Find the MGU for each of the follow b. Otherwise, write No MGU and just x) and S(G(u), G(G(z)), z) | | sts such an MGU, write | | |
| b. | S(A, B, B) and S(x, y, z) | | where A and B are constant symbols | | | |
| Ques | tion 2 (2pts | s) Translate the following sentence: | s from English to First-order log | gic. | | |
| No. | Score (pt) | Sentence | | | | |
| 1 | 0.25 | Sunflower seed is healthy or fatty | . | | | |
| 2 | 0.25 | Each seed is included in some bre | ead. | | | |
| 3 | 0.25 | Some bread includes no lean seed | l. | | | |
| 4 | 0.25 | No bread includes all seeds. | | | | |
| 5 | 0.5 | There are at least two lean seeds. | | | | |
| 6 | 0.5 | Some seed is healthy or fatty (but | both at different times). | | | |
| using • | Bread(x): | en predicates x is a bread • Seed(x): x • Healthy(x) | • | x): x is lean (not fatty) es(x, y): x includes y | | |
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |

SOLUTION

| Stude | ent ID: | | | Duration: | 15 mins | Date: 11/04/2023 | | |
|-------|----------------|--|---|------------------|---------------------------|--|--|--|
| Stude | ent name: | | | | | Score: / 3 | | |
| | | | ••••• | | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | |
| | | | | | | | | |
| - | | Find the MGU for each of to Otherwise, write No MGU | | • | If there exis | ts such an MGU, write | | |
| | |), G(x, w)) and P(A, F(w, I | , , , | | 3 are constar | nt symbols | | |
| - | | | | | | 10 0y 1110 010 | | |
| | | <u>//A, y/B }</u> | | | | | | |
| b. | P(x, F(x), A) | A, A) and P(y, F(A), y) | | where A is a c | onstant sym | bol | | |
| | No MGU. T | he two predicates have the | same name b | ut do not have t | he same nun | nber of arguments. | | |
| | | | | | | | | |
| Ques | tion 2 (2pts | Translate the following s | sentences fro | n English to Fir | st-order logi | ic. | | |
| No. | Score (pt) | Sentence | | | | | | |
| 1 | 0.25 | Brioche is a creamy bun, | , yet it does no | ot have eggs. | | | | |
| 2 | 0.25 | Every bun is sold in som | e convenienc | e store. | | | | |
| 3 | 0.25 | Some convenience store | s do not sell b | uns having egg | S. | | | |
| 4 | 0.25 | No convenience store se | lls all buns. | | | | | |
| 5 | 0.5 | Only one convenience st | Only one convenience store sells Brioche bun. | | | | | |
| 6 | 0.5 | Some buns are either cre | eamy or has e | ggs (but not bo | th at the sam | e time). | | |
| using | only the give | en predicates | | | | | | |
| • | | is a convenience store | • Bun(x): x | is a bun | Cream | y(x): x is creamy | | |
| • | Sells(x, y): | | | s a constant | • Egg(x) | : x has eggs. | | |
| | | • | | | | | | |
| 7. | Bun(Brioch | e) ∧ Creamy(Brioche) ∧ ¬E | gg(Brioche) | | | | | |
| 8. | ∀x Bun(x) | \rightarrow [\exists y Store(y) \land Sells(y, x |)] | | | | | |
| 9. | ∃x Store(x) | \wedge [\forall y Bun(y) \wedge Egg(y) \rightarrow – | ¬Sells(x, γ)] | | | | | |
| 10 |). ⊣∃x Store() | $\langle x \rangle \wedge [\ \forall y \ Bun(y) \rightarrow Sells(x,y)$ | y)] | | | | | |
| | | e) ∧ [∃x Store(x) ∧ Sells(Brid | | | | | | |
| | | | | | | | | |
| 1 ~ |) =v Dup(v) | (Croamy(y) /) | | | | | | |
| 12 | . ⊐x Bun(x) / | $(Creamy(x) \leftrightarrow \neg Egg(x))$ | | | | | | |
| | | | | | | | | |

| Stude | ent ID: | | Du | ration: 15 mins | Date: 11/04/2023 |
|--------------------|---|---|--|---|---|
| Stude | ent name: | | | | Score: /3 |
| the su a. b. | abstitution θ . Q(F(A), G(No MGU. W. Q(A, x, F(G)) $\theta = \{z/A, x/A\}$ | Find the MGU for each of Otherwise, write No MG(x)) and Q(y,y) (e cannot unify y with bot (y))) and Q(z, F(z), F(u) F(A), u/G(y)} | U and justify your ans where A here A and G(x), these to where A | wer. is a constant symbo wo functions are not is a constant symbo | ol t unifiable. ol |
| | ` ` | Translate the following | sentences from Englis | sh to First-order log | gic. |
| No. | Score (pt) | Sentence | l to talle and a sh | | |
| 1 | 0.25 | Baozi is a tasty bun, and | | | |
| 3 | 0.25 0.25 | Every bun contains son | | | |
| 4 | 0.25 | Some buns do not conta | | | |
| 5 | 0.25 | No egg is contained in a Baozi bun contains at le | | | |
| 6 | 0.5 | | | s cimultanoously) | |
| 0 | 0.5 | Every egg is either tasty | or sarry (but not both | i simuntameousiy j. | |
| • | Bun(x): x is Baozi is a c | | Tasty(x): x is tasty Salty(x): x is salty | • Egg(x | ains(x, y): x contains y x): x is an egg |
| 2. | ∀x Bun(x) | \rightarrow [\exists y Egg(y) \land Contains(| x, y)] | | |
| 3. | ∃x Bun(x) / | $(\forall y \; Egg(y) \land Salty(y) \rightarrow$ | —Contains(x, y)] | | |
| 4. | –∃x Egg(x) | $\wedge [\forall y \; Bun(y) \rightarrow Contains$ | (y, x)] | | |
| 5. | <u>Bun(Baozi)</u> | \wedge [$\exists x, y$, Egg(x) \wedge Egg(y) \wedge | Contains(Baozi, x) ∧ Co | ntains(Baozi, y) 🛆 🗆 | (x = y) |
| 6. | ∀x Egg(x) - | \rightarrow Tasty(x) \leftrightarrow \neg Salty(x) | | | |
| | •••••• | | | | |

| Stude | ent ID: | | | Duration: 15 n | nins | Date: 11/04/2023 |
|-------|---------------------------|--|-----------------------------------|------------------|-------------|--------------------|
| Stude | ent name: | | | | | Score:/_ |
| | | | | | | |
| - | | Find the MGU for each of Otherwise, write No MG | | | nere exists | such an MGU, write |
| a. | R(x, y, z) a | nd R(u, H(v, v), u) | | | | |
| | $\theta = \{ x/u, y/a \}$ | H(v, v), u/z } | | | | |
| b. | |)) and R(A, y, y) | | vhere A is a co | | |
| | No MGU. W | Ve cannot unify y with bot | h x and F(x), which a | re not unifiable | <u>)</u> . | |
| | | | | | | |
| Oues | tion 2 (2pts |) Translate the following | sentences from Eng | glish to First-o | rder logic. | |
| No. | Score (pt) | Sentence | | 9 | | |
| 1 | 0.25 | Baguette is not a brown | bread, and it is bac | l for diet. | | |
| 2 | 0.25 | Each shop sells some br | read. | | | |
| 3 | 0.25 | Some shop sells no brow | wn bread. | | | |
| 4 | 0.25 | There is no bread that a | all shop sells. | | | |
| 5 | 0.5 | There is exactly one bre | ead that is good for o | diet. | | |
| 6 | 0.5 | Each bread is brown or | bad for diet (but bo | oth at different | times). | |
| using | only the give | en predicates | | | | |
| • | Bread(x): x | x is a bread • I | Brown(x): x is brow | m • | Shop(x): x | is a bakery shop |
| • | Baguette is | s a constant • I | Diet(x): x is good for | r diet • | Sells(x, y) | : x sells y |
| 1. | Bread(Bagu | ıette) ∧ —Brown(Baguette |) ∧ ¬Diet(Baguette) | | | |
| 2. | ∀x Shop(x) | \rightarrow [\exists y Bread(y) \land Sells(x | <u>, γ) l</u> | | | |
| 3. | ∃x Shop(x) | \wedge [\forall y Bread(y) \wedge Brown(v | $y) \rightarrow \neg Sells(x, y)$ | | | |
| 4. | –∃x Bread | $(x) \wedge [\forall y Shop(y) \rightarrow Sells($ | (y, x)] | | | |
| | |) ∧ Diet(x) ∧ [∀y Bread(y) | | | | |
| • | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | in in the second | 7.7. | | |
| 6 | ∀y Rroad(y | $(x) \rightarrow Brown(x) \leftrightarrow Diet(x)$ | •••••• | | | ••••• |
| υ. | vy preadly | V V DIOMITY) (2 DIET(X) | | | | |
| | | | | | | |

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|------------|---------------------------|---|--|----------------------------|-------------|-----------------------------------|----------|
| Stude | ent ID: | | | Duration: 15 r | nins | Date: 11/04 | 1/2023 |
| Stude | ent name: | | | | | Score: | / 3 |
| | | Find the MGU for eac . Otherwise, write No | | | here exists | such an MGU | l, write |
| a. | S(x, G(x), x) | x) and S(G(u), G(G(z) |)), z) | | | | |
| | No MGU. W | le cannot unify x with | both z and G(z), whic | h are not unifiabl | e. | | |
| b. | S(A, B, B) | and S(x, y, z) | | where A and | B are cons | tant symbols | |
| | $\theta = \{ x/A, y/A \}$ | /B, z/B } | | | | | |
| | | | | | | | |
| Oues | tion 2 (2nts | Translate the follow | ving sentences from | Fnalish to First- <i>c</i> | order logic | | |
| No. | Score (pt) | Sentence | ving sentences irom | Eligion to Thot C | nuci logic. | 1 | |
| 1 | 0.25 | Sunflower seed is h | ealthy or fatty. | | | | |
| 2 | 0.25 | Each seed is include | | | | | |
| 3 | 0.25 | Some bread include | s no lean seed. | | | | |
| 4 | 0.25 | No bread includes a | ll seeds. | | | | |
| 5 | 0.5 | There are at least tv | vo lean seeds. | | | | |
| 6 | 0.5 | Some seed is health | y or fatty (but both a | it different times |). | | |
| using • | Bread(x): | _ | Seed(x): x is a seeHealthy(x): x is h | | | x is lean (not x, y): x includ | |
| 1. | Seed(Sunflo | ower) ^ [¬Lean(Sunflo | wer) ∨ Healthy(Sunfl | ower)] | | | |
| 2. | ∀x Seed(x) | \rightarrow [\exists y Bread(y) \land Inc | clude(y, x)] | | | | |
| 3. | ∃x Bread(x) | .∧[∀y_Lean(y)∧See | $d(y) \rightarrow \neg Contains(x, y)$ | <u>()] </u> | | | |
| 4. | ⊣∃x Bread | $(x) \land [\forall y \text{ Seed}(y) \rightarrow C$ | Contains(x, y)] | | | | |
| 5. | ∃x Seed(x) | \wedge Seed (y) $\wedge \neg$ (x = y) \wedge | ^ Lean(x) ∧ Lean(y) | | | | |
| | | | | | | | |
| 6. | ∃x Seed(x) | \wedge [Healthy(x) \leftrightarrow Lear | | | | | |
| | | | | | | | |
| | | | | | | | |