Exercise 1.

(a) $\exists x(Fx \wedge \forall y(Fy \to x=y) \wedge Lx)$

False because fails uniqueness.
More than 1 book.

(b) $\exists x(Px \wedge \forall y(Py \to x=y) \wedge Cx)$

False because fails attribution
From NC.

(c) $\exists x(Ox \wedge \forall y(Oy \to x=y) \wedge Px)$

False because fails existence.
No such object.

(d) $\exists x \exists y \exists z((Cx \wedge Cy \wedge Cz \wedge \forall w(Cw \to (w=x \vee w=y \vee w=z)) \wedge x \neq y \wedge x \neq z \wedge y \neq z)$

(e) $Hk \vee \forall x(Hx \to x=k)$ OR $\exists x(Hx \wedge \forall y(Hy \to x=y) \wedge x=k)$

(f) $\exists x(Px \wedge \forall y(Py \to x \geq y) \wedge Ex)$

Exercise 2.

(a) $\exists x(Px \wedge \forall y(Py \to x=y) \wedge \neg Bx)$

$\neg \exists x(Px \wedge \forall y(Py \to x=y) \wedge Bx)$

(b) $\exists x(Lx \wedge \forall y(Ly \to x=y) \wedge \neg Ex)$

$\neg \exists x(Lx \wedge \forall y(Ly \to x=y) \wedge Ex)$

(c) $W(s, \exists x(Mx \wedge \forall y(My \to x=y) \wedge \exists z(Ez \wedge \forall w(Ew \to z=w) \wedge x=z)))$

$\exists x(Mx \wedge \forall y(My \to x=y) \wedge \exists z(Ez \wedge \forall w(Ew \to z=w) \wedge W(s, x=z)))$

(d) $B(s, \exists x(Sx \wedge \forall y(Sy \to x=y) \wedge Fx))$

$\exists x(Sx \wedge \forall y(Sy \to x=y) \wedge B(s, Fx))$

Exercise 7.

$D = \{a, b\}$

$Ext\ P = \{a\}$

$Ext\ Q = \emptyset$

(1) $\exists x(Px \to Qx)$ is true relative to the interp because b is such an object that is not in the $Ext\ P$ and so $Pb \to Qb$ is true in the model.

(2) $\exists x Px \to \exists x Qx$ is false in the model since $Ext\ P$ is non empty and $Ext\ Q$ is empty. and so $\exists x Px$ is T and $\exists x Qx$ is false.

To show these sets exist:

$\emptyset$ exists by the null set axiom

$\{a\}$ exists by naive comprehension of the property of being a. OR better by axiom of pairing.

$\{a, b\}$ exists by naive comprehension of the property of being either a or b. OR better by axiom of pairing.

EMAIL FOR OTHER SOLUTIONS.