part2

1.

(a)

BH+ = ADBHGEFC

D+ = BDHAGEFC

BCE+ = BCEF violate

F+ = CF violate

A+ = ACGEF violate

(b)

Decompose R using FD, A->GEF, A+ = ACGEF

R1 = ACGEF

R2 = ABDH

Project FDs onto R1 = ACGEF

A	C	G	E	F	Closure	FDs
✓					A+ = ACGEF	A->CGEF
	✓				C+ = C	Nothing
		✓			G+ = G	Nothing
			✓		E+ = E	Nothing
				✓	F+ = FC	F->C violates BCNF

Decompose R1 using FD F->C, yields R3 = FC, R4 = FAGE

Project FD onto R3 = FC

F	C	Closure	FD
✓		F+ = FC	F->C
	✓	C+ = C	nothing

This satisfies BCNF

Project FD onto R4 = FAGE

F	A	G	E	Closure	FD
✓				F+ = FC	Nothing
	✓			A+ = AGEF	A-> GEF
		✓		G+ = G	Nothing
			✓	E+ = E	Nothing
Superset of A		Irrelevant			
✓		✓		FG+ = FGC	Nothing
✓			✓	FE+ = FCE	Nothing
		✓	✓	GE+ =GE	Nothing

This satisfies BCNF

Return to R2 = ABDH

A	B	D	H	Closure	FD
✓				A+ = ACGEF	Nothing
	✓			B+ = B	Nothing

		✓		D+ = DBHAGEFC	D->BHA
			✓	H+ = H	Nothing
Superset of D	Irrelevant				
✓	✓			AB+ = ABGEFC	Nothing
✓			✓	AH+ = AGEFHC	Nothing

This satisfies BCNF

R2 = ABDH, D->BHA
R3 = FC, F->C
R4 = FAGE, A->GEF
2.
(a)
A+ = A
B+ = B
C+ = C
D+ = DABGFEC Therefore D is a key
E+ = E
F+ = F
G+ = G
EF+ = EFB
Because ABCEFG+ = ABCEFG we know there is no key that does not have D.
D is the only key.
(b)
Simplify to singleton RHS.

DBE->F   DBE+ = DBECAFG   discard
DBE->C   DBE+ = DBEFAGC   discard
CD->A   CD+ = CDFABGE   discard
CD->F   CD+ = CDABGEF   discard
D->A   only way to get A   keep
D->B   D+ = DAGF   keep
D->G   only way to get G   keep
BADE->C   only way to get C   keep
ABD->E   only way to get E   keep
D->F   only way to get F   keep
EF->B   EF+ = EF   discard
We are left with
D->A
D->B
D->G
BADE->C
ABD->E

D->F

Reduce multiple attributes on LHS

BADE->C

    B+ = B

    A+ = A

    D+ = DABGE so we can reduce the LHS to D

ABD->E

    A+ = A

    B+ = B

    D+ = ABDGE so we can reduce the LHS to D

now we have

D->A

D->B

D->G

D->F

D->C

D->E

(c)

Merge RHS first.

D->ABCEFG

The relation will have these attributes

R1(A,B,C,D,E,F,G)

This relation follows 3NF, so it is the final relation

(d)

No it does not allow redundancy since if we project FDs onto relations, we can see that D is a superkey of R1.