Part 1:

S -> aSB | D|aa|aBaa|Sbcbb|SbDD

B -> b|aBa

D->aDa

Part 2:

1. Not CNF because A->aA ; not GNF because A->a
2. Not CNF because A->aA; not GNF because A->
3. It it CNF ; not CNF because B->SC
4. Not CNF because S->aA; not GNF: A->a

Part 3:

C is an extraneous nonterminal:

S->BSA |aB | cDA

A->B|S

B->b|

Add S -> S’:

S’ -> S

S->BSA |aB | cDA

A->B|S

B->b |

Elimanation : B -> , A->

First use B -> :

S’ -> S

S->BSA |aB | cDA | SA | a

A->B|S|

B->b

Then use A -> :

S’ -> S

S->BSA |aB | cDA | SA | a | BS | cD

A->B|S

B->b

Elimanation S -> S’ , A-> B , A-> S:

S’ -> BSA |aB | cDA | SA | a | BS | cD

S->BSA |aB | cDA | SA | a | BS | cD

A->b| BSA |aB | cDA | SA | a | BS | cD

B->b

Add X -> SA:

S’ -> BX |aB | cDA | SA | a | BS | cD

S->BX |aB | cDA | SA | a | BS | cD

A->b| BX |aB | cDA | SA | a | BS | cD

B->b

X -> SA

Part 4:

q1

ε,ε->z0

q2

ε

b,a->ε

q3

ε,ε->ε

ε

a,ε->a

ε,z0->ε

q3