1. SEI CERT C Rules

Here is the list and mapping of 34 SEI CERT C Rules derived from the 9 Toyota ITC defect categories.

1.1. List of SEI CERT C Rules

No.	Rule ID	Title
1	INT34-C	Do not shift an expression by a negative number of bits
2	ARR30-C	Do not form or use out-of-bounds pointers or array subscripts
3	MEM35-C	Allocate sufficient memory for an object
4	EXP34-C	Do not dereference null pointers
5	MSC12-C	Detect and remove dead code
6	INT31-C	Ensure that integer conversions do not result in lost or misinterpreted data
7	INT35-C	Use correct integer precisions
8	INT30-C	Ensure that unsigned integer operations do not wrap
9	INT32-C	Ensure that operations on signed integers do not overflow
10	MSC07-C	Detect and remove unused code
11	CON35-C	Ensure that shared objects are synchronized consistently
12	STR31-C	Guarantee that storage for strings has sufficient space for character data and the null terminator
13	MEM30-C	Do not access freed memory
14	MEM31-C	Free dynamically allocated memory exactly once
15	MEM34-C	Only free memory allocated dynamically
16	EXP36-C	Do not cast pointers into more strictly aligned pointer types
17	EXP37-C	Call functions with the correct number and type of arguments
18	ERR33-C	Detect and handle standard library errors
19	EXP20-C	Do not depend on the order of evaluation for side effects
20	ERR30-C	Set errno to zero before calling functions that set it
21	MSC13-C	Avoid deadlock by locking in a predefined order
22	DCL40-C	Do not create incompatible declarations of the same function or object
23	CON38-C	Ensure signals are handled consistently
24	MSC37-C	Ensure that control never reaches the end of a non-void function
25	FLP32-C	Prevent or detect domain and range errors in math functions
26	FLP34-C	Ensure that floating-point conversions are within range
27	ARR36-C	Do not subtract or compare pointers that do not refer to the same array
28	ARR37-C	Ensure that array indices are within valid bounds
29	CON33-C	Avoid race conditions when using library functions
30	CON43-C	Do not allow data races in multithreaded code
31	DCL30-C	Declare objects with appropriate storage durations
32	CON34-C	Declare objects shared between threads as atomic
33	EXP33-C	Do not read uninitialized memory
34	INT33-C	Ensure that division and remainder operations do not result in divide-by-zero errors

Table 1. SEI CERT C Rules found in the dataset

1.2. **Mapping of SEI CERT C Rules**

Toyota ITC Defect Type	**SEI CERT C Rules**
Concurrency defects	CON33-C, CON35-C, CON38-C, CON43-C
Dynamic memory defects	ARR30-C, MEM35-C, STR31-C
Inappropriate code	ERR30-C, ERR33-C, EXP20-C, MSC07-C, MSC12-C, MSC13-C
Misc defects	DCL40-C, EXP33-C, MSC12-C, MSC13-C, MSC37-C
Numerical defects	FLP32-C, FLP34-C, INT30-C, INT31-C, INT32-C, INT33-C, INT34-C, INT35-C
Pointer related defects	ARR36-C, ARR37-C, EXP33-C, EXP34-C, EXP36-C, EXP37-C, MEM34-C
Resource management defects	DCL30-C, ERR33-C, EXP33-C, MEM30-C, MEM31-C, MEM34-C, MEM35-C
Stack related defects	ARR30-C, CON34-C, DCL30-C, MEM35-C
Static memory defects	ARR30-C

Table 2. Mapping of Toyota ITC Defect Types to SEI CERT C Coding Standard Rules.