**APPENDIX C**

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***Trace Note – C1:*** *The mathematical trace steps specified in Eqs. (17) – (23) justifies quantum operations for each search pattern* *such that all* *indices corresponding to* *are identified separately using quantum core accessing on shared*

1. *Prepare quantum registers of each* *quantum core* *in zero states along with ancilla to set as one****,*** *and store each* *of size* *in register*

**: & (17)**

1. *Initialize superposition state in address register and ancilla of quantum core as*

**:**

**:**

*Now, data and pattern register used at quantum core is taking alongside for the further comparison, and separate the ancilla qubit, so we rewrite this state* *as*

**:**

**: (18)**

1. *For all in their separate uniform quantum superposition state* ***,*** *load data at* *as per entangled by applying of Eq. (1) as*

*Unitary of Eq. (3) is directly applied for data transformation from memory to register*

**:**

**:**

**: (19)**

*Repeat of Eq. (6) for* *times in superposition**by* *that is implicitly applied through* *for exact matching of**qubits size as*

*Apply by of Eq. (5) to find index* *as to assure exact match*

**:**

**: (20)**

*Apply reflection of Eq. (7) to mark as*

**:**

**:**

**:** *inverts**to**if solution exist, otherwise**as*

**:**

**:**

*Therefore, each oracle call computes negated amplitude for index* *to**obtain quantum state* *from the passed state* *to the oracle*

***Where,***

**(21)**

*Apply diffusion operator**of Eq. (8) for the inversion about the mean as*

**:**

**:**

**:**

*Therefore, after each diffusion operation, the amplitude of marked index**is increased by roughly**and finally on passing**to diffusion, we get state* *as*

**:(22)**

***Trace Note – C2:*** *The operator**is repeated until required**number of iterations are not completed,**thus, this assures the final quantum state that must be containing a high probable solution at marked index corresponding to****.***

1. *Measure final state after the needed iterations as to get the desired index* *as high probable solution.*

***Trace Note – C3:*** *A quantum state gets collapsed after each measurement****,*** *so its repetition ensures to report all**index location**of identified by quantum core* *as pattern match on behalf of output generated by exact search unitary used in****.***

1. *Verify for pattern using address register**of**core**to report the pattern occurrence at index* *as***(23)**