**APPENDIX D**

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***Trace Note – D1:*** *Trace steps Eqs. (24) – (31) justifies that identifies possible start / filtered location of each pattern**using quantum core accessing on shared****.*** *Iterate these number of steps until all likely* *indices corresponding to* *be not stored in****.*** *Further, trace steps Eqs. (32) – (39) describes the**mathematical proof of correctness of* *to ensure pattern match****.***

1. *Prepare each* *of size* *in register* *of quantum core* *and then store* *in array as preprocessed marking of possible start locations of distinct symbols for each pattern contained in register*

**& (24)**

1. *Prepare quantum registers of each* *quantum core* *in zero states including address and auxiliary registers, and the pattern register is still kept initialized*

**: (25)**

1. *Initialize superposition state in address register & entangle auxiliary register of as*

**:**

**: (26)**

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

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

**:**

**:**

**: (27)**

1. *Apply unitary operator* *on at**to mark the occurrence of each distinct symbols of pattern as in the entangled auxiliary register*

**:**

**:**

**: (28)**

1. *Apply unitary operator**on**at**to get possible start location of* *in auxiliary register**with index position as*

**:**

**:**

**: (29)**

1. *Apply Hamming Distance at* *to check for distance between text identified substring and pattern, such that,*  ***threshold* (30)**
2. *Perform Hadamard operation at**to zeroed its indices amplitudes and then merge amplitudes of entangled indices of* *as*

**:**

**:**

**: (31)**

1. *Measure auxiliary**and store the identified index as**in****.***

***Trace Note – D2:*** *As measurement destroys quantum state, so in each call at quantum core on behalf of, the approximate filtering needs its execution several times to filter all**indices location and then to store within the classical array****.***

***Trace Note – D3:*** *Below mentioned tracing steps are repeated to find all**exact occurrence of each**at quantum core by using individual unitary operator that lets the address registers to access original filtered indices with the help of location register****.*** *So****,*** *further steps are written for**to report all occurrences of pattern****.***

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*

**: (32)**

1. *Initialize superposition state in location 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*

**:**

**: (33)**

1. *Apply an implicit unitary operator**to obtain the original filtered text index as*

**:**

**:**

**:**

**: (34)**

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

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

**:**

**:**

**: (35)**

*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* *to assure exact match*

**:**

**: (36)**

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

**:**

**:**

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

**:**

**:**

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

***Where,***

**(37)**

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

**:**

**:**

**:**

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

**:(38)**

***Trace Note – D4:*** *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 – D5:*** *The quantum state gets collapsed after each measurement****,*** *so its repetition will ensure to report all* *index location**of identified by the quantum core* *as pattern match over likely filtered indices stored in****.*** *Still, the output based on behalf of exact search unitary is used within the operator****.***

1. *Verify for pattern using address register**of**core**to report the pattern occurrence at index**as* **(39)**