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Q1(a)

(i) expected number of probes required in an unsuccessful search of open addressing hashing $= \frac{1}{1-\alpha}$ where α = load factor

$$\alpha = \frac{n}{m} = \frac{54}{60} = 0.9$$

$\therefore$ expected number of probes $= \frac{1}{1-0.9}$

$= 10$

(ii) $P_r\{x = t\} = \frac{E\{x = t\}}{t} = \frac{10}{i}$ (Ans:)

(iii)

Ans 2:(a)

(i) The probability that the first probe will be unsuccessful is α (load factor) as it only depends on how many elements are already inserted in the table.

$$\therefore \alpha = \frac{n}{m} = \frac{5}{11} = 0.4545$$

(Ans)

(ii)

i	$i^2 \pmod{11}$
0	0
1	1
2	4
3	9
4	5
5	3
6	3
7	5

here we can see first 5 probes are differ and there's no duplicate index there. Thus the probability that element will be inserted within the first 6 probes =

$$Pr\{x \leq t\} = 1 - Pr\{x \geq t\}$$

$$= 1 - \frac{E\{x \geq t\}}{t} \quad \text{[using markov's theorem]}$$

$$= 1 - \frac{\frac{1}{1-\alpha}}{6}$$

$$= 1 - \frac{\frac{1}{1-\frac{5}{11}}}{6} = \frac{25}{36}.$$

Q.3

$h(10) = 10 \% 11 = 10$

$h(22) = 22 \% 11 = 0$

$h(31) = 9$

$h(4) = 4$

$h(15) = 4$

$h(15,1) = 5$ [linear]

$h(15,1) = 5$ [quad]

$h(28) = 6$

$h(16) = 5$
$h(16,1) = 6$
$h(16,2) = 7$
} linear

$h(16,2) = 9$
$h(16,3) = 3$
} quad

0	1	2	3	4	5	6	7	8	9	10
22	59			4	15	28	16	17	31	10

linear probing

0	1	2	3	4	5	6	7	8	9	10
22			16	4	15	28	17	59	31	10

quadratic probing

$h(17) = 6$, $h(17,1) = 7$

$h(17,2) = 8$

$h(59) = 4$, ... $h(59,8) = 1$

$h(59,2) = 8$ [quad]

- There is one large primary cluster in linear probing starting from index 1 and ending at 2 (after circulating).