Q.NO 1 Sol:

$$x_0 = x_0$$

$$x_1 = a_1 x_0 + b_1$$

$$x_2 = a_2 a_1 x_0 + a_2 b_1 + b_2$$

$$\vdots$$

$$x_n = (a_n \cdots a_1) x_0 + a_n \cdots a_2 b_1 + a_n \cdots a_3 b_2 + \cdots + a_n b_{n-1} + b_n$$

If we define c_i as $(a_i \cdots a_2 a_1) x_0$

and d_i as $d_i = \frac{b_i}{c_i}$

Then $x_i = c_i \left(1 + \sum_{i=1}^{i-1} \frac{b_i}{c_i} \right)$

$= c_i \left(1 + \sum_{i=1}^{i-1} d_i \right)$

Now c_i is just (the prefix scan of a_i) $* x_0$

which has $\log n$ depth

also accumulation of d_i is $\log n$

depth

Hence

Work

Pseudocode:

```
function evaluate(a, b, x0, n)
    c = x0 * prefix_scan_multiply(a);        n
    parfor i=1:n
        d(i) = b(i) / c(i);                  1
    end
    e = 1 + prefix_scan_sum(d);              n
    parfor i=1:n
        x(i) = e(i) * e(i)                   1
```

Q.NO.2

Clock times

n		
10000	0.054886 s	} 8 threads
100000	0.376566 s	
1000000	Segmentation Fault.	
10^4	0.035139 s	} 4 threads
10^5	0.282213 s	
10^6	Seg fault.	

Pseudo code:

```
S = parscan ( a, N)
    pardo
    if (N/2 > 0)
        S1 = parscan (a(0), N/2);
        S2 = parscan ( a(N/2), N/2);
    end
    &
    end
    S = [S1, S2];
```

The code crashes for higher $n > 10^6$. Cause is still not known.

Q.NO. 3

The code could not be debugged within stipulated time

However algorithm used is as follows

pseudo code:

```
function:- bsearch (key, a, n, p)
    b = n/p;
    parfor i = 1 : p
        if (key_in_middle (i*b, (i+1)*b)
        mid = (i*b + (i+1)*b) / 2 ;
        if (key_in_middle (i*b, mid)
        j = bsearch ( key, a, n/2p, p) ;
        end
        elseif key_in middle (mid, (i+1)*b) )
        bsearch (key, a(mid+1), n/2p, p) ;
        elseif (key = a(mid) && b == 1)
            j = 1 ;
        end
    end
    if j == 1
        print ("key found") ;
```