(40) $G = (V, E) \longrightarrow$ directed, weighted graph

$\quad W: E \to R \qquad , \quad (u, v) \in E$

$\quad f: V \to R$

(i)

$\quad W(u, v) \qquad$ as $\qquad W(u, v) + f(u) - f(v)$

" The shortest path in G under w are shortest paths under ω "—

$\longrightarrow$ (i) If and only if $f(u)$ is the distance from s to u in the graph obtained by adding a new vertex s to G & edges of 0 weight from s to every vertex of G.

(41) balanced binary search tree, worst case time complexity / range $[a, b]$, no. of reported element $= K$

(B)

Sol^n

$$\boxed{\Theta(\log n + K)}$$

(42) No of permutation : LILAC

if No char appear original position —

12

$\quad L's \; position \; ways = {}^3C_2 = 3 \; ways$

$\quad I, A, C \quad can \; be \quad = 2 \times 2! = 4 \; ways$

$\quad Total = \boxed{12 \; ways} \; Ans$

$n > 2$, $a \in \{0, 1\}^n$ be non-zero vector

x choose random from $\{0, 1\}^n$

0.5

probability $-$ $\sum_{i=1}^{n} a_i x_i$ is odd

Sol^n

$$a = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{bmatrix} \qquad n = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$$

$$P\left(\sum_{i=1}^{n} a_i x_i \text{ is odd} \right) = \frac{{}^n C_1 + {}^n C_3 + \cdots}{2^n}$$

$$= \frac{2^{n-1}}{2^n} = \boxed{0.5}$$

55

```
int fun1 ( int n )
{
    static int i=0;
    if (n>0)
    {   ++i;
        fun1 (n-1);
    }
    return (i);
}
```

```
int fun2 ( int n )
{
    static int i=0;
    if (n>0)
    {   i = i+ fun1 (n);
        -fun2 (n-1);
    }
    return (i);
}
```

fun : Fun 2 (5) = 55   Ans

47⟹ represent min heep contain 1023 elements
find max, minimum compresians.

511
Soln

No. of element = $\left[\dfrac{1023}{2}\right]$ = 512

Bubble sort ⟶ min (511) compairs

48⟹

81

```
int top (int b, int *arr)        int pp( int a, int b)
{  int i;                        {  int arr [20];
   for(i=0; b>0; i++)               int i, tot = 1, ex, len;
   { if(b%2)                        ex = 4;
          arr[i] = 1;               len = tob (b, arr);
     else                          for(i=0; i<len; i++)
          arr[i] = 0;              {
                                      if (arr[i] == 1)
     b = b/2;                            tot = tot * ex;
   }                                   ex = ex * ex;
   return(i);                      }
}                                  return(tot);
                                 }
```

PP(3, 4) = 81

Graph $G = (V, E)$, $V = \{V_1, V_2, \ldots V_{100}\}$,

$E = \{(V_i, V_j) \mid 1 \leq i \leq j \leq 100\}$

edge (V_i, V_j) is $|i - j|$
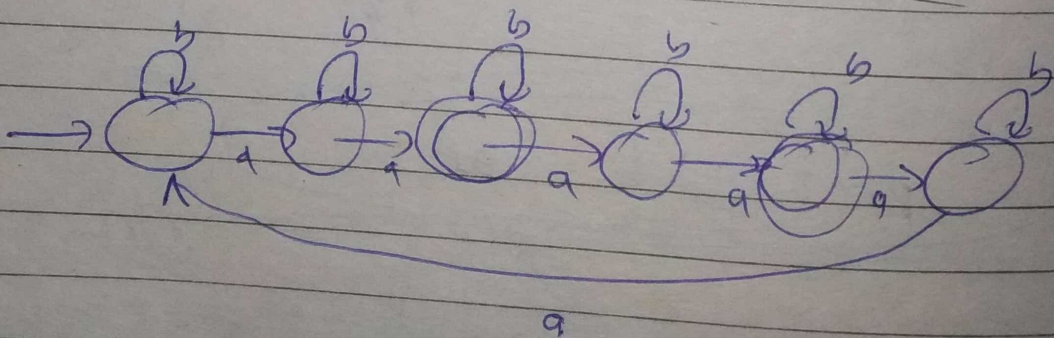
minimum spanning tree = ?

(99)

Sol⇒

⟹

3 MST
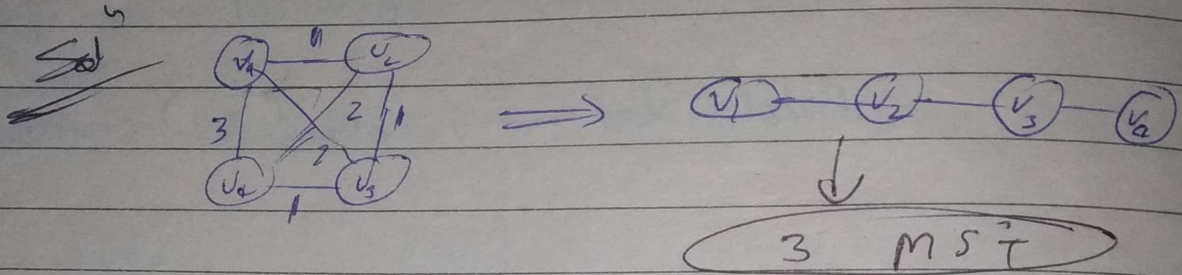
So 100 edges ⟶ 99 MST

(50)⇒

(51)⇒ $L = \{x \in \{a, b\}^* \mid$ no. of a's in x is divisible
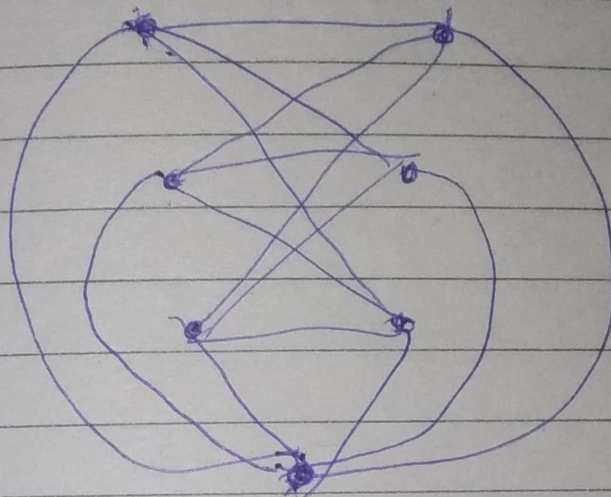
by 2. not 3 }

minimum state for DFA

(6)

a

G is obtained by adding vertex S to $K_{3,4}$ making S adjacent to every vertex of $K_{3,4}$

minimum edge & colum.

Sol^n

(9)

Block Size = 4 KB
Search key = 12 bytes
Tree pointer = 8 bytes
DB records ~~+ minimum~~ = 1000000

$$P \times Bp + (P-1) \text{ key} \leq \text{Block size}$$
$$P \times 8 + (P-1) \times 12 \leq 4096$$
$$20 P \leq 4108$$
$$P = \left\lfloor \frac{4108}{20} \right\rfloor = 205$$

10^6 record

$$\left\lfloor \frac{10^6}{205} \right\rfloor = 4902 , \left\lfloor \frac{4902}{205} \right\rfloor = 24 , \left\lfloor \frac{24}{205} \right\rfloor = 1$$

Total = 4