

~~AA Quiz 2 S24~~ Solution

### DFS( $G$ )

```

1 for each vertex  $u \in G.V$ 
2    $u.\text{color} = \text{WHITE}$ 
3    $u.\pi = \text{NIL}$ 
4    $\text{time} = 0$ 
5 for each vertex  $u \in G.V$ 
6   if  $u.\text{color} == \text{WHITE}$ 
7     DFS-VISIT( $G, u$ )
  
```

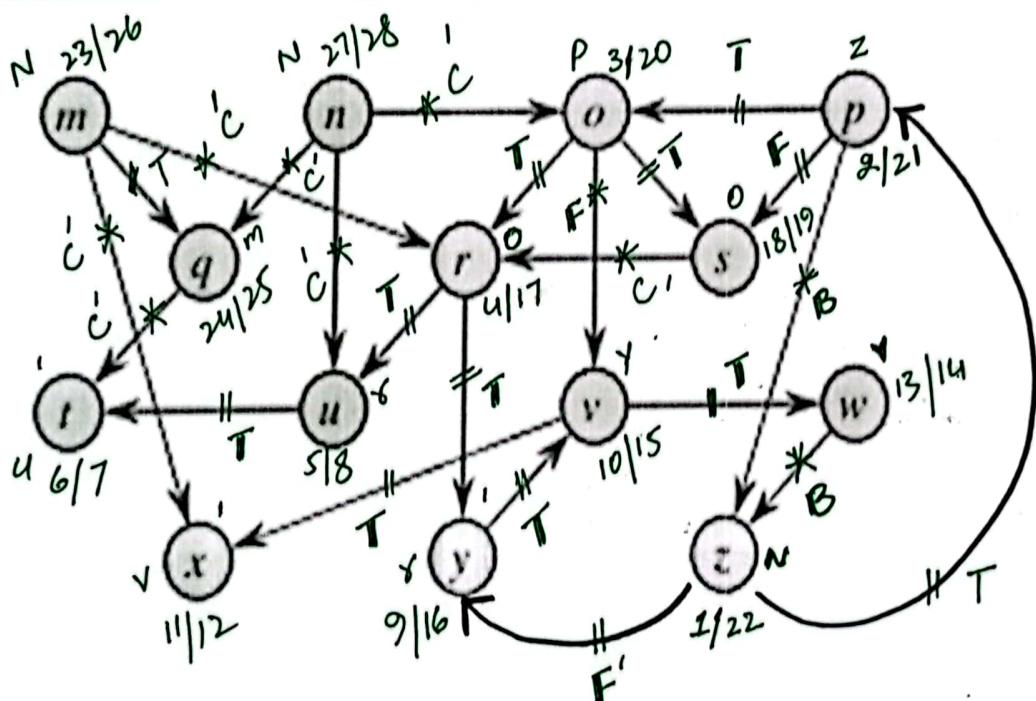
### DFS-VISIT( $G, u$ )

```

1    $\text{time} = \text{time} + 1$ 
2    $u.d = \text{time}$ 
3    $u.\text{color} = \text{GRAY}$ 
4 for each  $v \in G.\text{Adj}[u]$ 
5   if  $v.\text{color} == \text{WHITE}$ 
6      $v.\pi = u$ 
7     DFS-VISIT( $G, v$ )
8    $u.\text{color} = \text{BLACK}$ 
9    $\text{time} = \text{time} + 1$ 
10   $u.f = \text{time}$ 
  
```

Apply DFS algorithm on the given graph and answer the following questions. (Note: The adjacent nodes of a vertex are to be traversed in alphabetical order, and DFS algorithm will also work in alphabetical order.) The source node is 'Z'.

1. Write the type of each edge of the below graph, complete work should be there.
2. Write updated details for all the vertices when DFS-VISIT ( $G, u$ ) [7<sup>th</sup> line Inside the DFS-VISIT] called for the 6<sup>th</sup> time (Just Called) write the values for all vertices ('Parent', 'color', 'd-time', 'f-time').
3. Write down details for all the vertices when Line 8 of DFS-VISIT ( $G, u$ ) completed its work for 5<sup>th</sup> time - write the values of their ('Parent', 'color', 'd-time', 'f-time').



T	F	B	C
II	3	2	7

AA Quiz 2 S24 Sol

- ~~N/B/13/22~~  $Z \rightarrow P, Y^{*11}$   
~~Z/B/12/21~~  $P \rightarrow O^{*2}, S, Z^{*10}$   
~~P/B/13/20~~  $O \rightarrow Y^{*3}, S, V^{*9}$   
~~O/B/14/21~~  $\rightarrow U, Y^{*7}$   
~~S/B/15/18~~  $U \rightarrow T^{*1}$   
~~U/B/16/17~~  $T \rightarrow *^{*1}$   
~~S/B/19/16~~  $Y \rightarrow V^{*6} ( \text{soft } -/- )$   
~~B~~  $V \rightarrow X, W^{*5}$   
~~Y/B/10/15~~  $V \rightarrow X, Y^{*3}$   
~~V/B/11/12~~  $X \rightarrow *^{*3}$   
~~V/B/13/14~~  $W \rightarrow Z^{*4}$   
~~O/B/18/19~~  $S \rightarrow Y^{*6}$   
~~N/B/23/26~~  $m \rightarrow N, Y, X^{*13}$   
~~m/B/24/25~~  $n \rightarrow t^{*12}$   
~~N/B/27/28~~  $n \rightarrow O, Y, U$

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

186  
187  
188  
189  
190  
191  
192  
193  
194  
195  
196  
197  
198  
199  
200

$\text{DFS}(G)$

```

1 for each vertex  $u \in G.V$ 
2    $u.color = \text{WHITE}$ 
3    $u.\pi = \text{NIL}$ 
4  $time = 0$ 
5 for each vertex  $u \in G.V$ 
6   if  $u.color == \text{WHITE}$ 
7     DFS-VISIT( $G, u$ )

```

**DFS-VISIT( $G, u$ )**

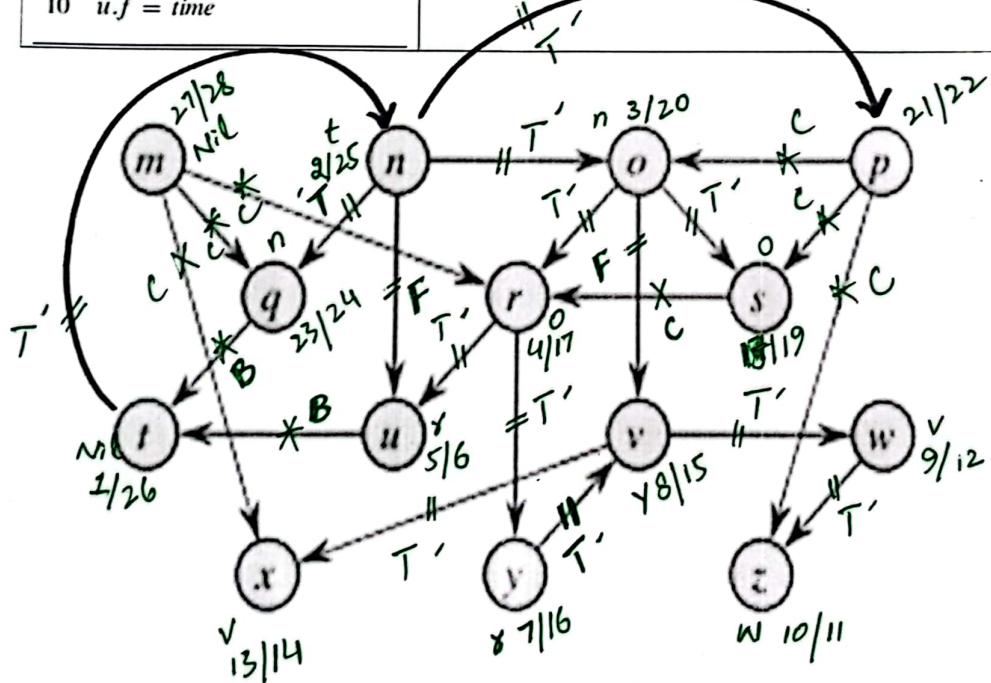
```

1  time = time + 1
2  u.d = time
3  u.color = GRAY
4  for each v ∈ G.Adj[u]
5      if v.color == WHITE
6          v.π = u
7          DFS-VISIT(G, v)
8  u.color = BLACK
9  time = time + 1
10 u.f = time

```

Apply DFS algorithm on the given graph and answer the following questions. (Note: The adjacent nodes of a vertex are to be traversed in alphabetical order, and DFS algorithm will also work in alphabetical order.) The source node is 't'.

1. Write the type of each edge of the below graph, complete work should be there.
  2. Write updated details for all the vertices when DFS-VISIT ( $G, u$ )  
[7<sup>th</sup> line inside the DFS-VISIT] called for the 6<sup>th</sup> time (Just Called) write the values for all vertices ('Parent', 'color', 'd-time', 'f-time').
  3. Write down details for all the vertices when Line 8 of DFS-VISIT ( $G, u$ ) completed its work for 5<sup>th</sup> time - write the values of their ('Parent', 'color', 'd-time', 'f-time').



$b - c$   
 $2 - B$   
 $2 - F$   
 $12 - T$

$t \rightarrow n^*$	$s \rightarrow r^*$
$n \rightarrow o, p, q, u^*$	$r \rightarrow o, s, z^*$
$o \rightarrow y, s, v^*$	$p \rightarrow o, s, z^*$
$y \rightarrow u, y^*$	$q \rightarrow t^*$
$u \rightarrow v^*$	$r \rightarrow q, y, x^*$
$v \rightarrow w, x^*$	$s \rightarrow r^*$
$w \rightarrow z^*$	
$x \rightarrow *$	
$y \rightarrow *$	
$z \rightarrow *$	

Q-2

Inside DFS-visit called for 6th time (Line 7)  
 (only that vertex parent changed)

	(1)	(2)	P	W	(3)	S
m	n	o	w	w	g	w.
w	g	g			o	n
N	t	n	N	N	4	-
-	2	3	-	-	-	-
-	-	-	-	-	-	-
t	u	v	w	x	y	z
g	b.	w	h	u	g	w
N	y	y	N	N	8	n
I	s	-	-	-	7	-
#	6	-	-	-	-	-

Sorry  
 tell  
 color it  
 parent  
 and

Q-3 Line-8 vertex wkt has been completed, but time (if not assigned)

5th

	n	o	P	W	y	S
w	g	g	w	w	g	w
N	t	n	N	N	4	-
-	2	3	-	-	-	-
-	-	-	-	-	-	-
t	u	v	w	x	y	z
g	b	b	g	b	g	b
N	y	y	v	v	8	w
I	s	g	9	13	7	10
-	6	-	12	14	-	11

\*↑

**DFS( $G$ )**

```

1 for each vertex  $u \in G.V$ 
2    $u.\text{color} = \text{WHITE}$ 
3    $u.\pi = \text{NIL}$ 
4    $\text{time} = 0$ 
5 for each vertex  $u \in G.V$ 
6   if  $u.\text{color} == \text{WHITE}$ 
7     DFS-VISIT( $G, u$ )
  
```

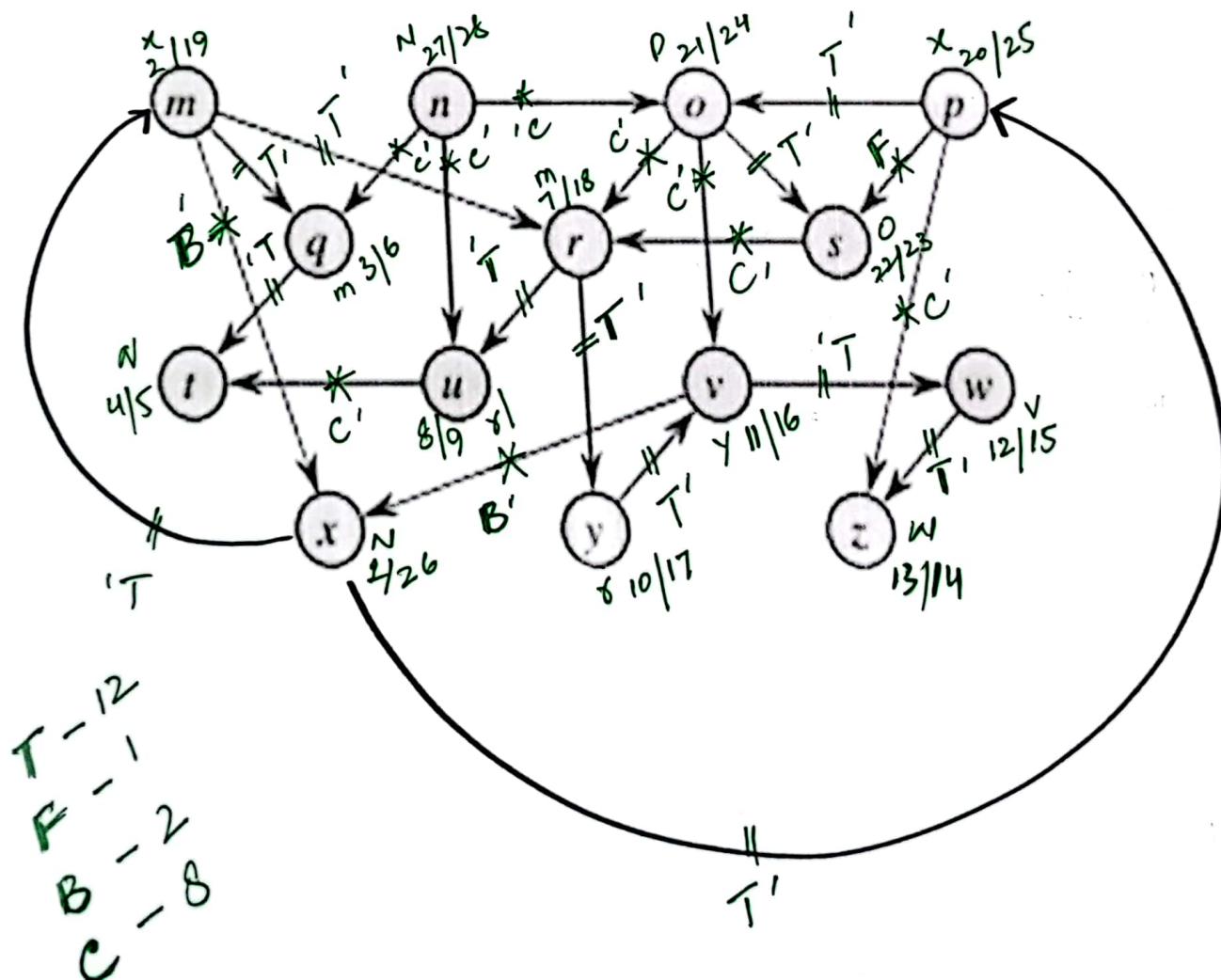
**DFS-VISIT( $G, u$ )**

```

1  $\text{time} = \text{time} + 1$ 
2  $u.d = \text{time}$ 
3  $u.\text{color} = \text{GRAY}$ 
4 for each  $v \in G.\text{Adj}[u]$ 
5   if  $v.\text{color} == \text{WHITE}$ 
6      $v.\pi = u$ 
7     DFS-VISIT( $G, v$ )
8  $u.\text{color} = \text{BLACK}$ 
9  $\text{time} = \text{time} + 1$ 
10  $u.f = \text{time}$ 
  
```

Apply DFS algorithm on the given graph and answer the following questions. (Note: The adjacent nodes of a vertex are to be traversed in alphabetical order, and DFS algorithm will also work in alphabetical order.) The source node is 'x'

1. Write the type of each edge of the below graph, complete work should be there.
2. Write updated details for all the vertices when DFS-VISIT ( $G, u$ ) [7<sup>th</sup> line inside the DFS-VISIT] called for the 6<sup>th</sup> time (Just Called) write the values for all vertices ('Parent', 'color', 'd-time', 'f-time').
3. Write down details for all the vertices when Line 8 of DFS-VISIT ( $G, u$ ) completed its work for 5<sup>th</sup> time - write the values of their ('Parent', 'color', 'd-time', 'f-time').



8/16/26 X → m, P. f.

$\rightarrow 16.7 \text{ J/g}^{\circ}\text{C}$   $\rightarrow V, T, E$

$$m[\theta]/\epsilon \rightarrow t^{\alpha}$$

Q1: If  $y = \frac{1}{x}$ , then  $\frac{dy}{dx} =$

11/2/18 x → y

7/14/18/18 0 →  first solo w/ parent about

Y |  $\frac{5}{6}$  |  $\rightarrow$  Y →  $\frac{5}{6}$

$\gamma$  ~~for~~  $\pi$   $\rightarrow \pi^+$

$$\sqrt{d} \cdot \text{size} \rightarrow \mathbf{Z}^*$$

$\text{W(B)} \cong \mathbb{Z} \rightarrow \mathbb{Z}$

10/13/25  $P \rightarrow O, S, Z$

$f_1 = 100$  C  $\Rightarrow$   $X_1 S_1 V$

01/01/2012 C → Y, S, ✓  
E → Y, ✓

1981-2-12 S → ~~Y~~

3/14/27/26 → 0, 9, 4

N/B/1/26 X →  $m, P$   
X/B/2/19 m →  $v, r, x$   
m/B/3/6 v →  $t$

v/B/4/5 t → \*  
m/B/7/18 r →  $u, y$

r/B/8/9 u → ~~t~~  
here only v parent changed

r/B/10/17 y →  $v$   
y/B/11/16 v →  $x, w$   
v/B/12/15 w →  $z$  → w color changed but u.f not assign

w/B/13/14 z → \*  
x/B/20/25 p →  $o, s, z$   
r/B/21/24 o →  $r, s, v$   
r/B/22/23 s →  $r$   
j/B/27/28 n →  $o, v, u$

✓ th?  
\* th?

y x m n t s r k b d o u w m

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

② →

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

① →

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

③ →

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

⑤ →

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

④ →

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

→

1	2	6	5	4	3	2	1	14	13	10	9	8	7	6	5	4	3	2	1	
m	x	m	m	B	m	m	r	Z	V	N	G	G	t	s	m	r	m	B	n	z

### DFS( $G$ )

```

1 for each vertex  $u \in G.V$ 
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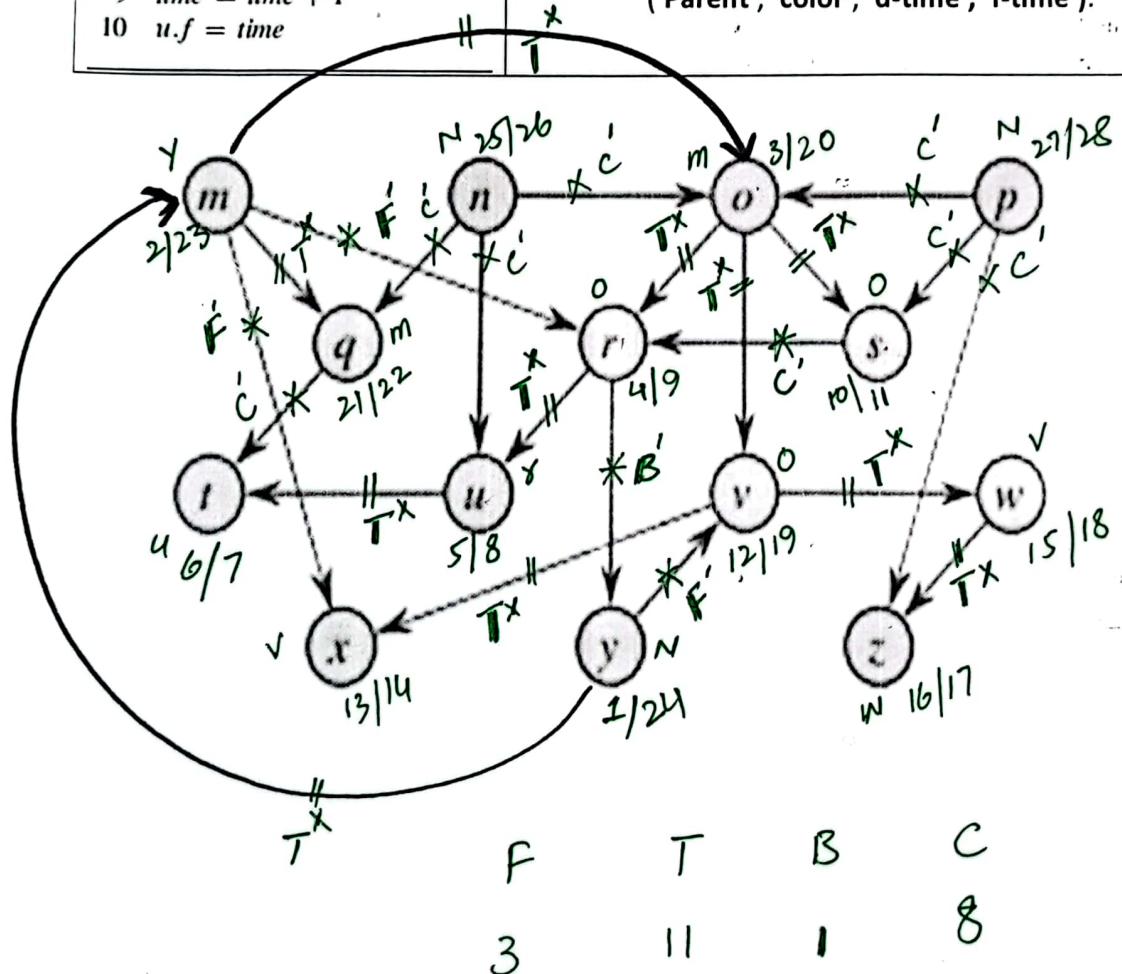
### DFS-VISIT( $G, u$ )

```

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2  $u.d = \text{time}$ 
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8  $u.\text{color} = \text{BLACK}$ 
9  $\text{time} = \text{time} + 1$ 
10  $u.f = \text{time}$ 
  
```

Apply DFS algorithm on the given graph and answer the following questions. (Note: The adjacent nodes of a vertex are to be traversed in alphabetical order, and DFS algorithm will also work in alphabetical order.) The source node is 'y'.

1. Write the type of each edge of the below graph, complete work should be there.
2. Write updated details for all the vertices when DFS-VISIT ( $G, u$ ) [7<sup>th</sup> line inside the DFS-VISIT] called for the 6<sup>th</sup> time (Just Called) write the values for all vertices ('Parent', 'color', 'd-time', 'f-time').
3. Write down details for all the vertices when Line 8 of DFS-VISIT ( $G, u$ ) completed its work for 5<sup>th</sup> time - write the values of their ('Parent', 'color', 'd-time', 'f-time').



- $\begin{matrix} \text{N} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{2} & | \\ & & \text{Y} & & \rightarrow & \text{m}, \text{v} & \star^{12} & & & \end{matrix}$   
 $\begin{matrix} \text{Y} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{2} & | \\ & & \text{m} & \rightarrow & \text{o}, \text{q}, \text{y}, \text{x} & \star^{11} & & & \end{matrix}$   
 $\checkmark$   
 $\star^{5th}$
- $\begin{matrix} \text{m} & | & \text{G} & | & \text{I} & | & \text{3} & | & \text{2} & | \\ & & \text{o} & \rightarrow & \text{r}, \text{s}, \text{v} & \star^{10} & & & \end{matrix}$   
 $\begin{matrix} \text{o} & | & \text{G} & | & \text{I} & | & \text{4} & | & \text{9} & | \\ & & \text{r} & \rightarrow & \text{u}, \text{y} & \star^3 & & & \end{matrix}$   
 $\begin{matrix} \text{r} & | & \text{G} & | & \text{I} & | & \text{5} & | & \text{8} & | \\ & & \text{u} & \rightarrow & \text{t} & \star^2 & & & \end{matrix}$   
 $\begin{matrix} \text{u} & | & \text{G} & | & \text{I} & | & \text{6} & | & \text{7} & | \\ & & \text{t} & \rightarrow & \star & \star^1 & & & \end{matrix}$
- $\text{---} \quad \text{---} \quad \text{---}$   
 $\begin{matrix} \text{o} & | & \text{G} & | & \text{I} & | & \text{1} & | & \text{1} & | \\ & & \text{s} & \rightarrow & \text{y}, \star^4 & & & & \end{matrix}$   
 $\begin{matrix} \text{o} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{9} & | \\ & & \text{v} & \rightarrow & \text{x}, \text{w} & \star^8 & & & \end{matrix}$   
 $\begin{matrix} \text{v} & | & \text{G} & | & \text{I} & | & \text{3} & | & \text{1} & | \\ & & \text{x} & \rightarrow & \star, \star^5 & & & & \end{matrix}$   
 $\begin{matrix} \text{v} & | & \text{G} & | & \text{I} & | & \text{5} & | & \text{8} & | \\ & & \text{w} & \rightarrow & \text{z} & \star^7 & & & \end{matrix}$   
 $\begin{matrix} \text{w} & | & \text{G} & | & \text{I} & | & \text{6} & | & \text{1} & | \\ & & \text{z} & \rightarrow & \star, \star^6 & & & & \end{matrix}$   
 $\begin{matrix} \text{m} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{2} & | \\ & & \text{q} & \rightarrow & \text{t} & \star^{10} & & & \end{matrix}$   
 $\begin{matrix} \text{N} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{6} & | \\ & & \text{n} & \rightarrow & \text{o}, \text{q}, \text{u} & \star^{13} & & & \end{matrix}$   
 $\begin{matrix} \text{N} & | & \text{G} & | & \text{I} & | & \text{2} & | & \text{8} & | \\ & & \text{p} & \rightarrow & \text{o}, \text{s}, \text{z} & \star^{14} & & & \end{matrix}$

m	n	a.	p	q	r	s	t	u	v	w	x	y	z
m	n	a.	p	q	r	s	t	u	v	w	x	y	z
b	b	b	b	b	b	b	b	b	b	b	b	b	b
3	4	5	6	7	8	9	10	11	12	13	14	15	16
(3)	(4)	(1)	(2)	-	-	-	-	-	-	GB	N	V	W
(5)	-	-	-	-	-	-	-	-	-	G	Y	X	Z

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100