Design and Analysis of Algorithms — Sri Sai Anusha Gandu

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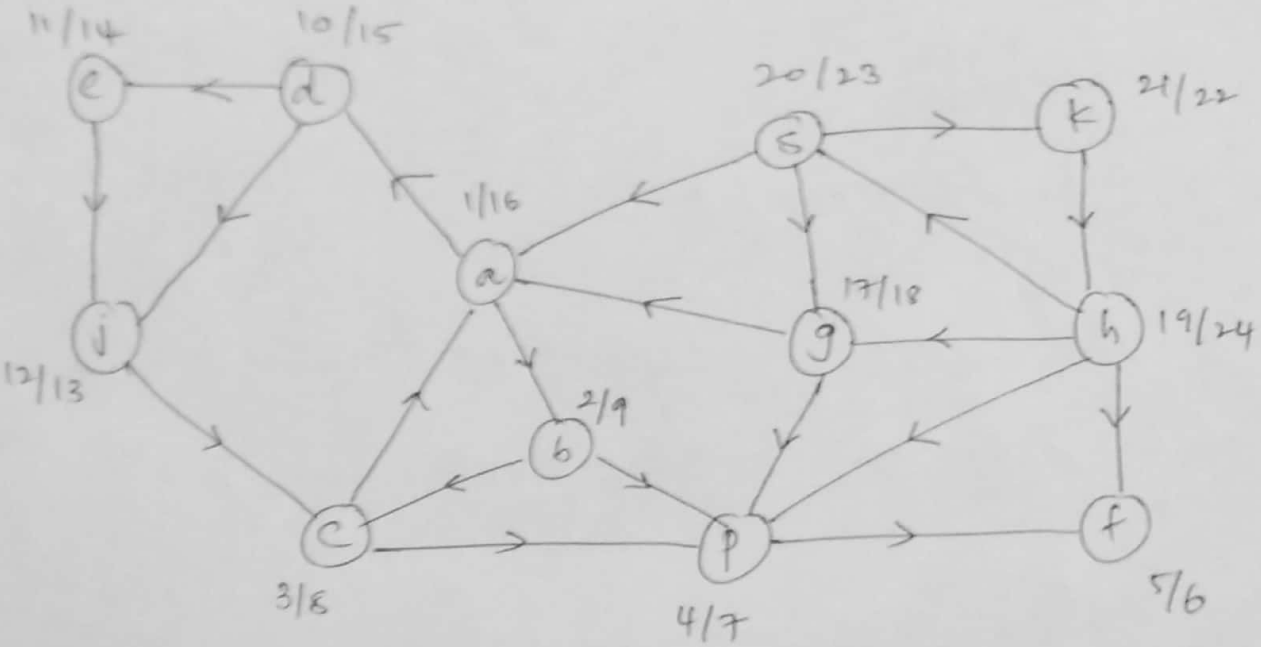
Assignment # 4

1. Conduct a DFS for the following graph. Start traversal from 'a'

Sol:



The traversal paths are

$\phi \rightarrow a$	$d \rightarrow e$
$a \rightarrow b$	$e \rightarrow j$
$b \rightarrow c$	$\phi \rightarrow g$
$c \rightarrow p$	$\phi \rightarrow h$
$p \rightarrow f$	$h \rightarrow s$
$a \rightarrow d$	$s \rightarrow k$

White

a, b, c, d, e, f, g, h, j, k, p, s

Gray

a, b, c, p, f, d, e, j, g, h, s, k

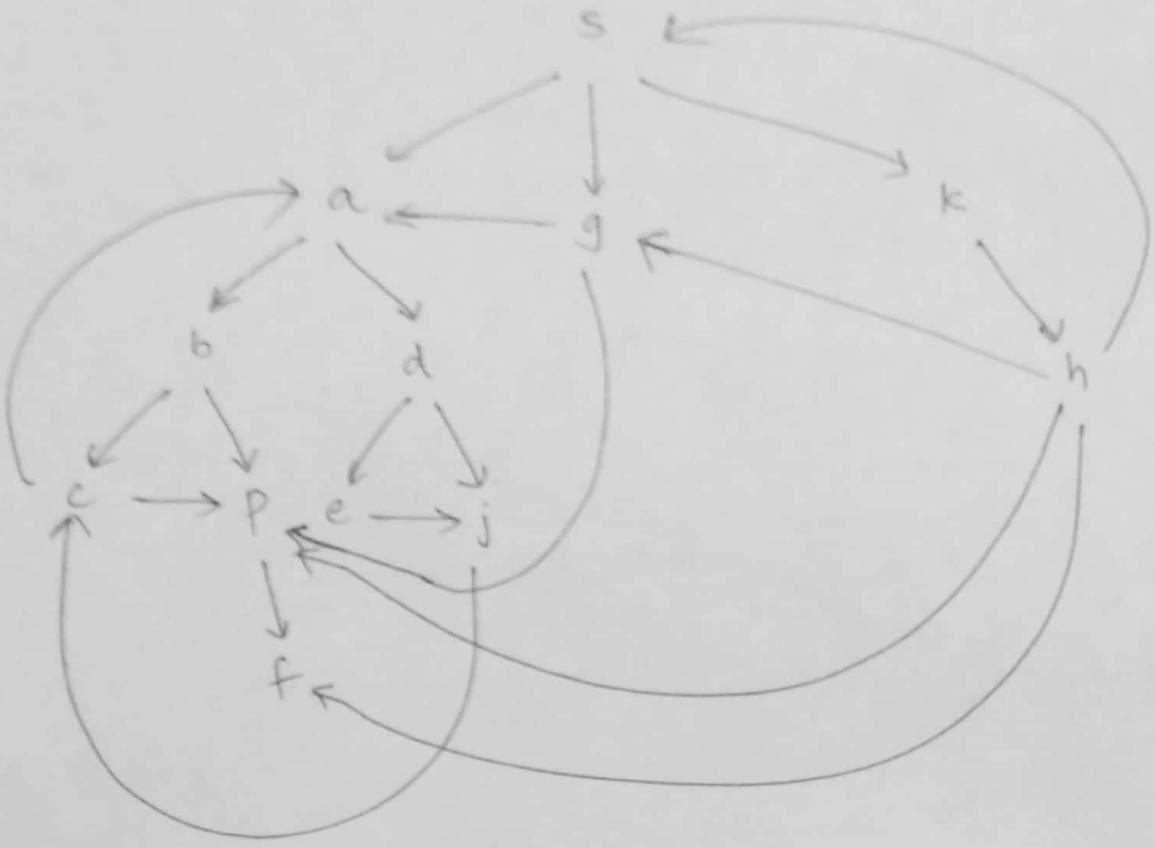
Black

f, p, c, b, j, e, d, a, g, k, s, h.

Hence, the output of Depth-First-Search would be f, p, c, b, j, e, d, a, g, k, s, h.

2. list all the edges that belong to set of back edges, forward edges and cross edges.

Sol. The graph given can be redrawn as shown.

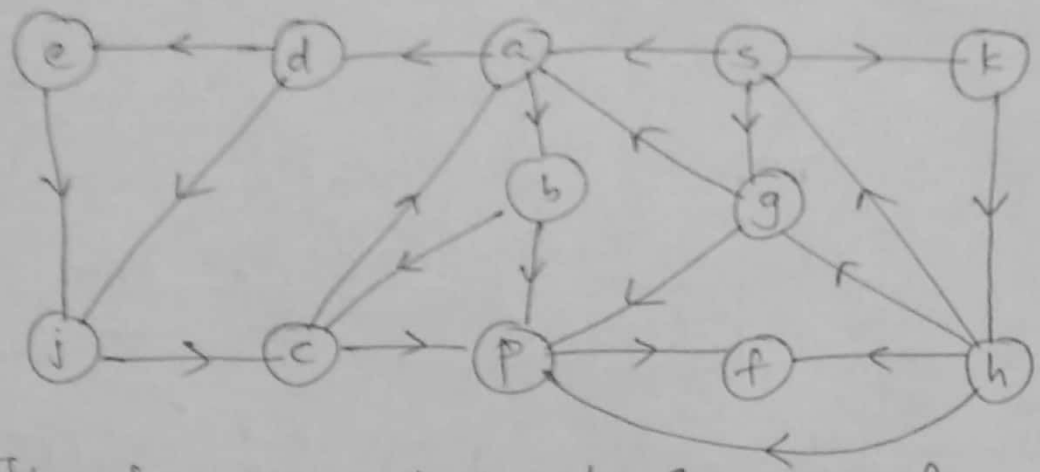


Back Edges	Forward Edges	Cross Edges
$h \to s$	—	$c \to p$
$c \to a$		$e \to j$
		$g \to a$
		$h \to g$
		$j \to c$
		$h \to p$
		$h \to f$
		$g \to p$

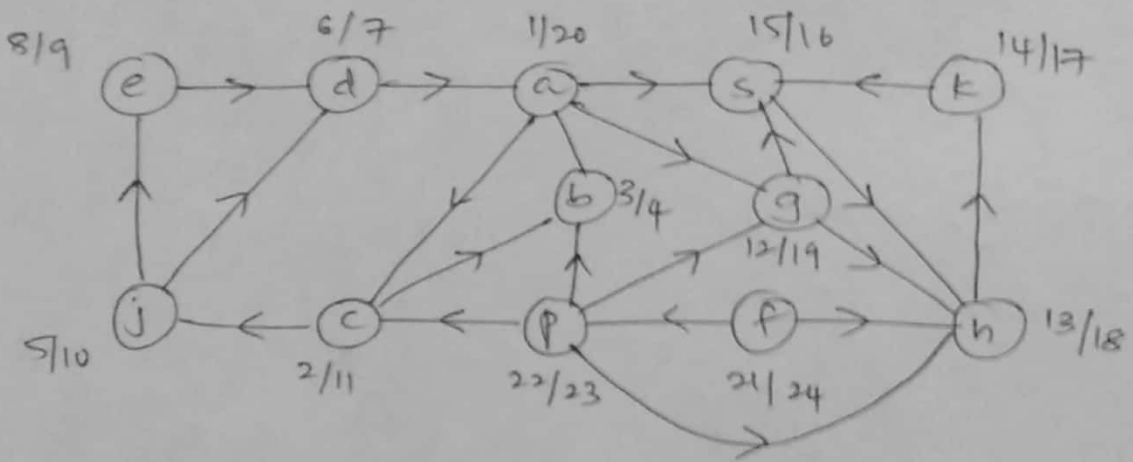
3. Identify the strongly connected components and draw the components graph.

Sol^n

The graph is shown below.



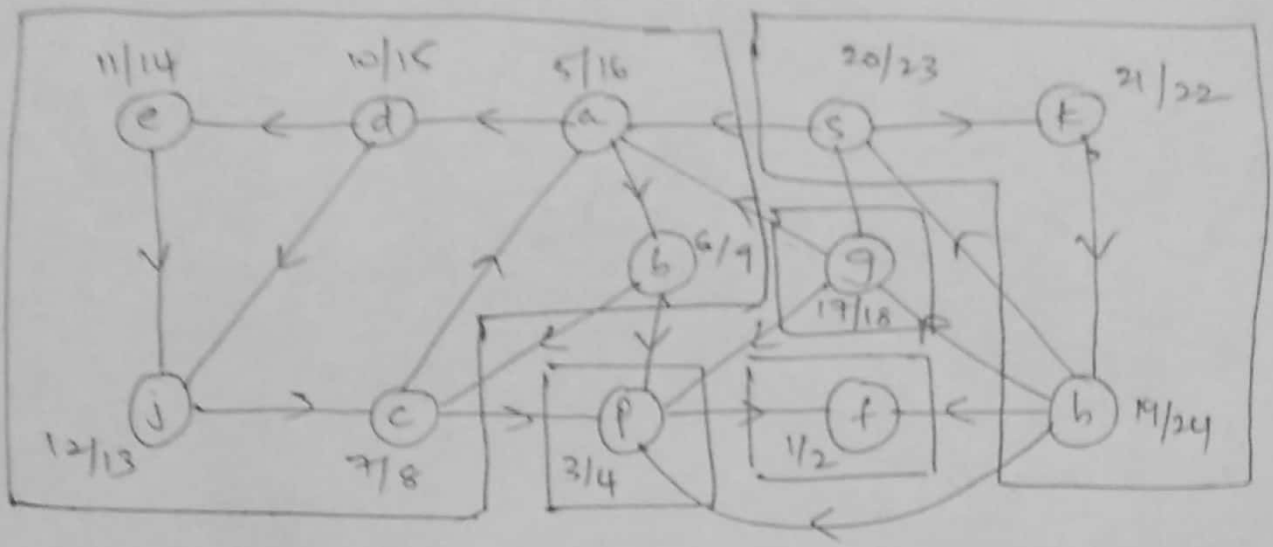
This when reversed can be shown as follows



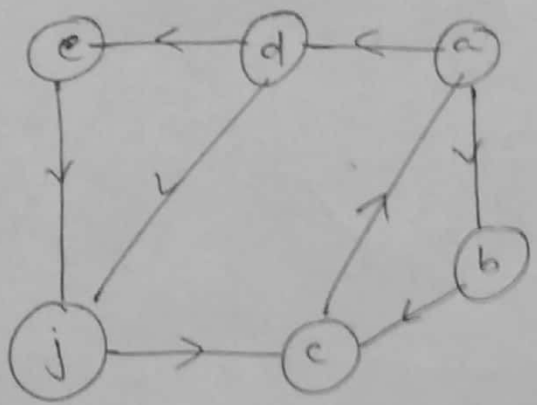
When the denominators are arranged in descending order, we have

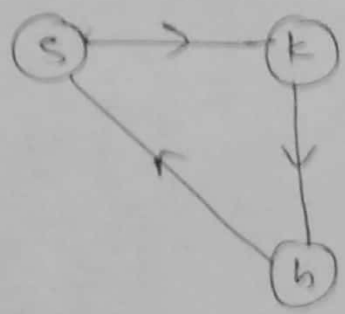
f, p, a, g, h, t, s, c, j, e, d, b

Now redrawing the original graph with the same order, we have



And performing DFS, with f, p, a, g, h, t, s, c, j, e, d, b in order, we have 5 connected (strongly connected) graphs





J

P

f