Design And Analysis of Algorithms

Assignment #4

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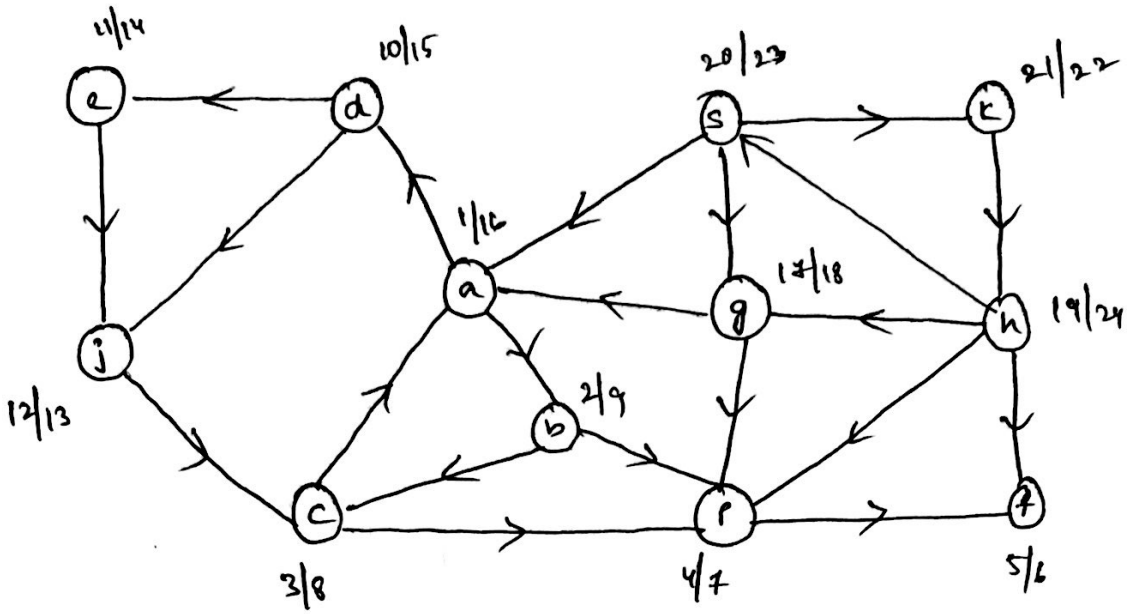
1. conduct the DFS for the following graph start traversal from 'a'

Ans:



The traversal paths are

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

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

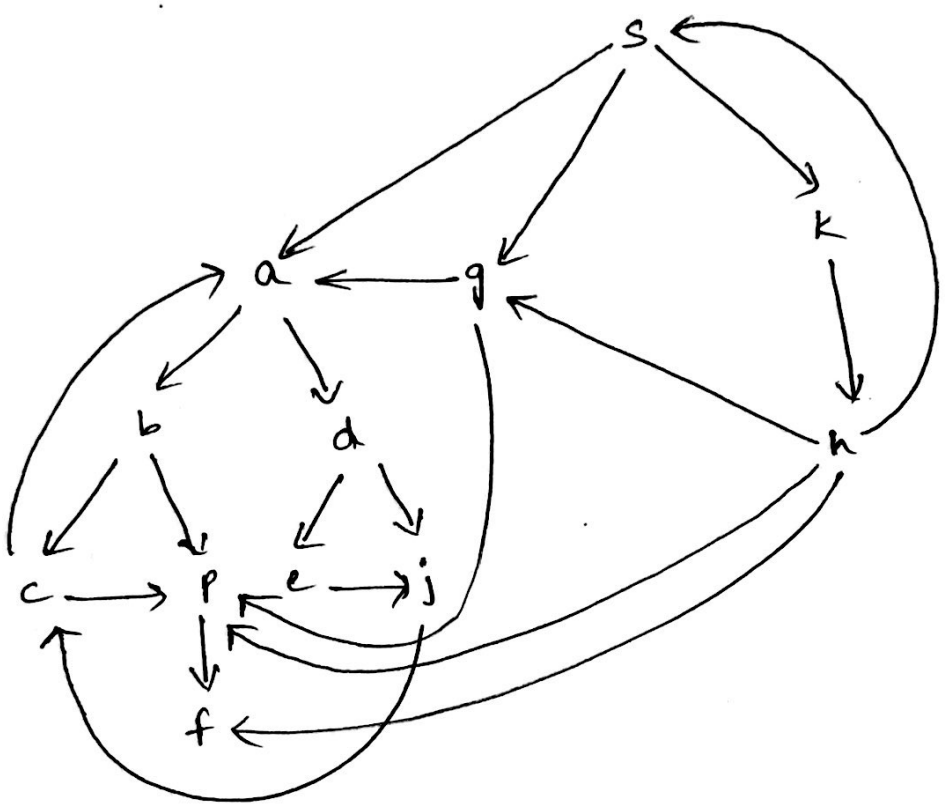
Black

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

Ans: The graph given can be redrawn as shown below.



Back Edges

$h \rightarrow s$

$c \rightarrow a$

Forward Edges

—

Cross Edges

$c \rightarrow p$

$e \rightarrow j$

$g \rightarrow a$

$h \rightarrow g$

$j \rightarrow e$

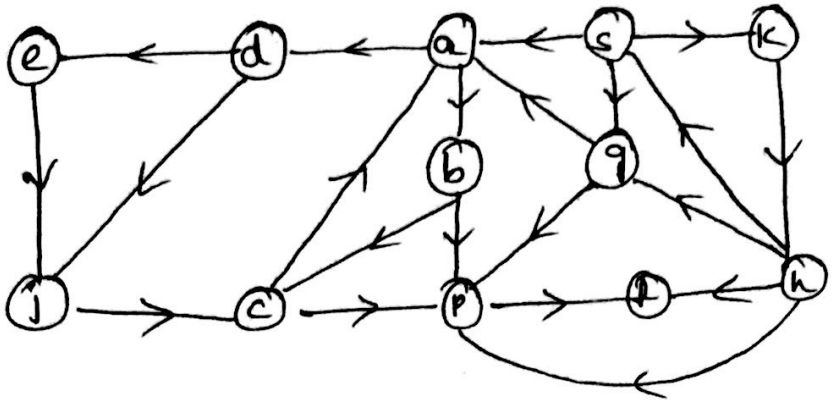
$h \rightarrow p$

$h \rightarrow f$

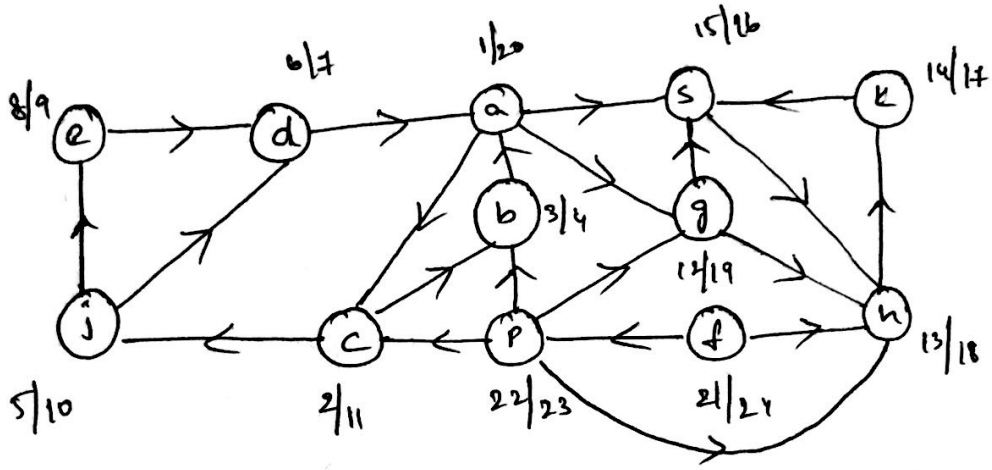
$g \rightarrow p$

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

Ans: The graph is shown below



This when reversed can be shown as follows

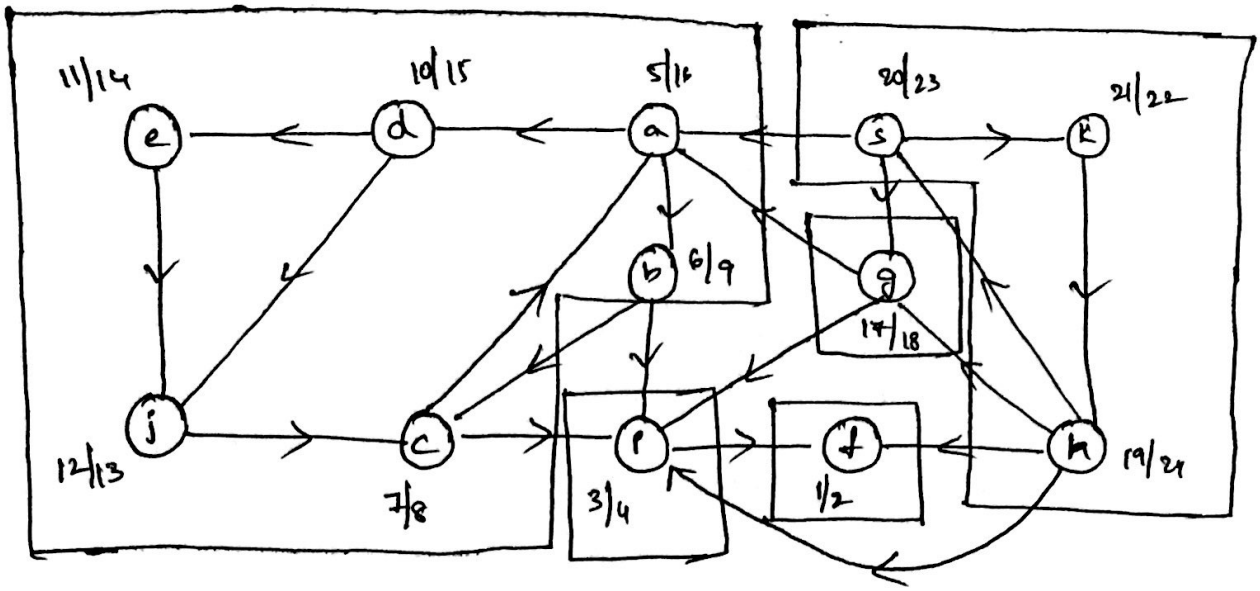


when the denominators are arranged in descending Order we have.

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

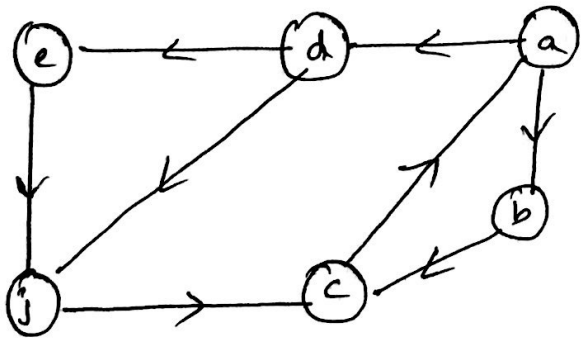
Now redrawing the Original graph with the same Order have.

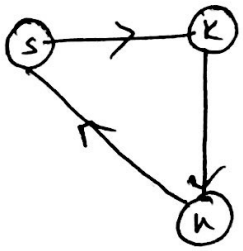
The Graph is shown as below



And performing DFS, with t, p, a, g, h, k, s, c j, e, d, b

in order, we have 5 connected (strongly Connected) Components in graph





g

p

t