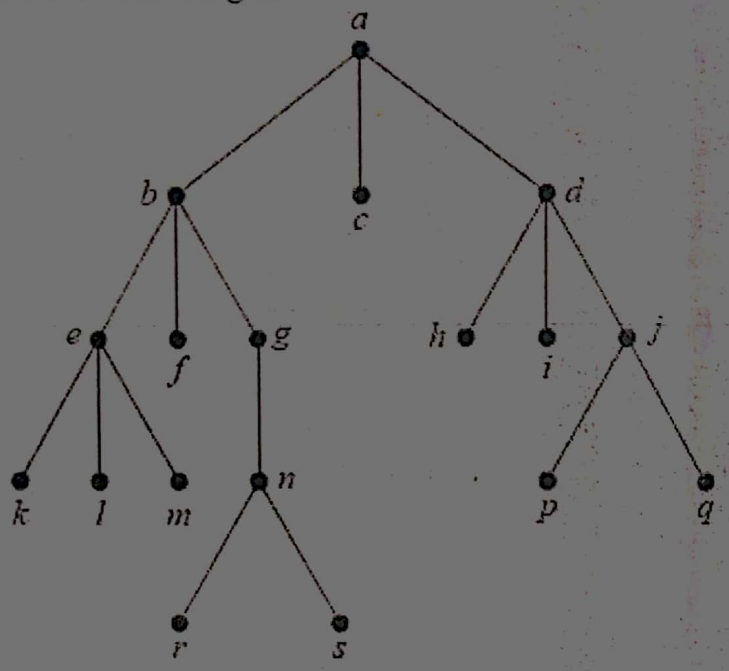
Section B: Long Question

Question 05: **[Marks: 15]**
[CLO-6] **[Applying]**

Consider the following rooted tree:



Answer the following questions:

a. Identify the siblings, ancestor and descendants of vertex h. **[3]**
b. Give the post-order traversal of rooted tree. **[3]**
c. Identify whether the given tree is balanced or not. Justify your answer. **[3]**
d. Find the value of the following prefix expression. **[3]**
$* + 3 + 2 \uparrow 3 + 2\ 3\ 2$
e. Find the value of the following postfix expression. **[3]**
$4\ 2 * 2 \uparrow 7\ 3 - 8\ 2 / * -$

Question 06: **[Marks: 6.5+6.5=13]**
[CLO-4] **[Applying]**

a. Using Proof by Contraposition, show that, if $2n^3 - 3n$ is odd then n is an even integer.
b. Use Mathematical Induction, show that for all integers $n \geq 1$, $3^{2n} - 1$ is divisible by 4.

Question 07: **[Marks: 6+2+2=10]**
[CLO-5] **[Applying]**

a. Calvin wants to go to Milwaukee. He can choose from 33 bus services or 22 train services to head from home to downtown Chicago. From there, he can choose from 2 bus services or 3 train services to head to Milwaukee. A bus ticket will only allow him to take buses, and a train ticket will only allow him to take trains. **[2*3=6]**
I. How many ways are there for him to get to Milwaukee from home?
II. How many ways are there to plan a trip route for round-trip form home to downtown Chicago?

Name:_____ Registration #:_____

III. How many ways are there to plan a trip route for round-trip form hometown to Chicago, without using a route more than once?

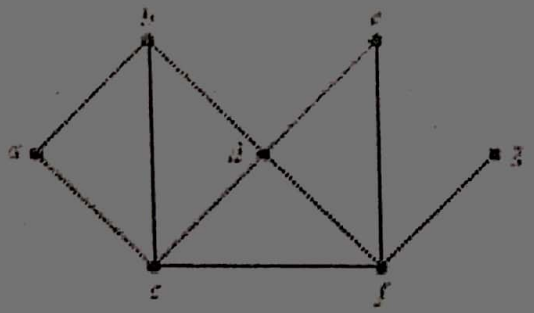
b. A mobile pin code consists of from four to six digits. Find the total numbers of possible pin codes? **[2]**

c. How many bit strings of length 12 either begin with three 1's or end with two 0's? **[2]**

Question 08: **[Marks: 3+3+4+3+1+1=15]**

[CLO-6] **[Applying]**

Determine the degree of each vertex, adjacency list, distance matrix, eccentricity of each vertex, radius and diameter of the following graph:



a = 4 5
b = 6
c = 6
d = 3
e = 6
f = 4
g =