

Q4.(a) For Doc 1

$$\vec{v}_1 = \frac{40\vec{f} + 5.2\vec{a} + 0\vec{d} + 15\vec{h}}{\sqrt{40^2 + (5.2)^2 + 0^2 + (15)^2}}$$

$$= \frac{40\vec{f} + 5.2\vec{a} + 0\vec{d} + 15\vec{h}}{\sqrt{1852.04}}$$

$$= \frac{40\vec{f} + 5.2\vec{a} + 0\vec{d} + 15\vec{h}}{\sqrt{1852.04}}$$

$$\sqrt{1852.04} = 43.035$$

$$= \underline{0.9295\vec{f} + 0.12083\vec{a} + 0\vec{d} + 0.3486\vec{h}}$$

$$= [0.9295, 0.12083, 0, 0.3486]$$

For Doc 2

$$\vec{v}_2 = \frac{6.6\vec{f} + 40.3\vec{a} + 51.2\vec{d} + 0\vec{h}}{\sqrt{6.6^2 + 40.3^2 + 51.2^2 + 0^2}}$$

$$= \frac{6.6\vec{f} + 40.3\vec{a} + 51.2\vec{d} + 0\vec{h}}{\sqrt{4289.09}}$$

$$= \frac{6.6\vec{f} + 40.3\vec{a} + 51.2\vec{d} + 0\vec{h}}{\sqrt{4289.09}}$$

$$\sqrt{4289.09}$$

$$\sqrt{4289.09}$$

$$= 65.491$$

$$= \underline{0.1001\vec{f} + 0.6153\vec{a} + 0.7818\vec{d} + 0\vec{h}}$$

$$= [0.1001, 0.6153, 0.7818, 0]$$

For Doc 3

$$\vec{v}_3 = \frac{21.3\vec{f} + 0\vec{a} + 40.5\vec{d} + 21.2\vec{h}}{\sqrt{21.3^2 + 0^2 + 40.5^2 + 21.2^2}}$$

$$\sqrt{21.3^2 + 0^2 + 40.5^2 + 21.2^2}$$

$$= \underline{21.3\vec{f} + 0\vec{a} + 40.5\vec{d} + 21.2\vec{h}}$$

$$\sqrt{2543.38}$$

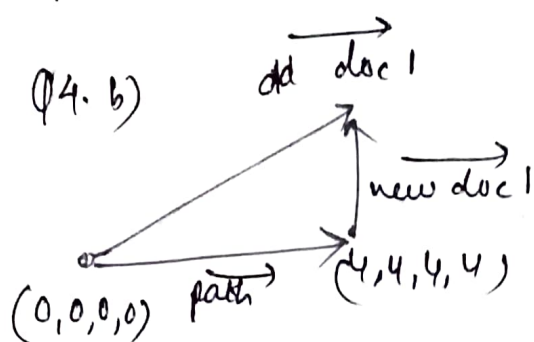
$$\sqrt{2543.38}$$

$$= 50.432$$

$$= \underline{0.422\vec{f} + 0\vec{a} + 0.803\vec{d} + 0.4203\vec{h}}$$

$$= [0.422, 0, 0.803, 0.4203]$$

Q4. b)



No. Normalised vector does not remain the same on changing the origin.

In the above diagram, we can see that  $\vec{\text{new-doc1}}$  changes on changing the origin.

$$\vec{\text{path}} = [4, 4, 4, 4]$$

$$\vec{\text{old doc1}} = [0.9295, 0.12083, 0, 0.3486]$$

$$\vec{\text{new doc1}} = \vec{\text{old doc1}} - \vec{\text{path}}$$

$$= [0.9295, 0.12083, 0, 0.3486] - [4, 4, 4, 4]$$

$$= \underline{[-3.0705, -3.87917, -4, -3.6514]}$$

Q4. c) <sup>(1)</sup>  $q = \text{"(feign-deck)"}$

for doc1,

$$\text{score}(q, d_1) = \text{tf-idf}_{\text{feign}, d_1} \cdot 1 + \text{tf-idf}_{\text{deck}, d_1} \cdot 1$$

$$= \text{tf-idf}_{\text{feign}, d_1}$$

$$= \underline{40}$$

for doc2

$$\text{score}(q, d_2) = \text{tf-idf}_{\text{feign}, d_2} \cdot 1 + \text{tf-idf}_{\text{deck}, d_2} \cdot 1$$

$$= 6.6 + 51.2 = \underline{57.8}$$

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For doc 3,

$$\begin{aligned}\text{Score}(q, d_3) &= \text{tf-idf}_{\text{flynt}, d_3} + \text{tf-idf}_{\text{deck}, d_3} \\ &= 21.3 + 40.5 \\ &= 61.8\end{aligned}$$

Rank { Document 3 (61.8)  
Document 2 (57.8)  
Document 1 (40)

(ii)  $\text{idf}_{\text{flynt}} = 1.65$ ,  $\text{idf}_{\text{deck}} = 1.56$

For doc 1,

$$\begin{aligned}\text{score}(q, d_1) &= \text{tf-idf}_{\text{flynt}, d_1} \cdot \text{idf}_{\text{flynt}} + \text{tf-idf}_{\text{deck}, d_1} \cdot \text{idf}_{\text{deck}} \\ &= (40)(1.65) + (0)(1.56) \\ &= 66\end{aligned}$$

For doc 2

$$\begin{aligned}\text{score}(q, d_2) &= \text{tf-idf}_{\text{flynt}, d_2} \cdot \text{idf}_{\text{flynt}} + \text{tf-idf}_{\text{deck}, d_2} \cdot \text{idf}_{\text{deck}} \\ &= (6.6)(1.65) + (51.2)(1.56) \\ &= 90.762\end{aligned}$$

For doc 3

$$\begin{aligned}\text{score}(q, d_3) &= (21.3)(1.65) + (40.5)(1.56) \\ &= 98.325\end{aligned}$$

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$$\therefore \text{Rank} = \begin{cases} \text{Document 3} & (98.325) \\ \text{Document- 2} & (90.262) \\ \text{Document 1} & (66) \end{cases}$$

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