

$$\begin{array}{rcl}
 \text{Q1) I/p image volume} & = & h \times w \times d \\
 \text{filter} & = & 35 \times 15 \times 20 \\
 \text{Stride} & = & 13
 \end{array}$$

$$\text{i) Depth of output} = \text{no. of filters} = 50$$

\therefore 50 filters were used

$$\text{(ii) Say i/p volume} = (H+4) \times (W+6) \times D$$

$$600 = \frac{(H+4) - F}{S+1} = \frac{H+4 - 35}{14}$$

$$(600 \times 14) + 35 - 4 = H = 8431 //$$

$$500 = \frac{(W+6) - F}{S+1} = \frac{W+6 - 15}{14}$$

$$W = 7009 //$$

$$D = 20 //$$

$$\therefore \text{i/p Vol} = 8431 \times 7009 \times 20$$

Q2) Image \rightarrow $(H \ W \ D)$
 $3 \times 3 \times 3$

$$a_{h,w,d} \rightarrow h \in \{1,2,3\}; w \in \{1,2,3\}; d \in \{1,2,3\}.$$

$$\text{Filter} \rightarrow 2 \times 2 \times 3$$

$$\text{o/p Im} \rightarrow 2 \times 2$$

$$\text{filter weights} \rightarrow f_{h,w,d} \Rightarrow h \in \{1,2\}, w \in \{1,2\}, d \in \{1,2,3\}.$$

$$\text{gradient of loss wrt o/p im} \Rightarrow D_{h,w}$$

$$\text{Find grad. of loss wrt } f_{1,1,2} \text{ \& } a_{2,2,2}$$

$$\frac{\partial L}{\partial f_{1,1,2}} = \frac{\partial L}{\partial \text{Output}_{h,w}} \times \frac{\partial \text{Output}_{h,w}}{\partial f_{1,1,2}}$$

$$= D_{h,w} \times \sum_{i=1,2} \sum_{j=1,2} a_{i+h-1, j+w-1, 2}$$

$$\frac{\partial L}{\partial a_{2,2,2}} = \frac{\partial L}{\partial \text{Output}_{h,w}} \times \frac{\partial \text{Output}_{h,w}}{\partial a_{2,2,2}}$$

$$= D_{h,w} \times \sum_{i=1,2} \sum_{j=1,2} \sum_{k=1,2} f_{h+i, w+j, d+k}$$

Q3) Test accuracy = 0.6280, loss = 1.3672

