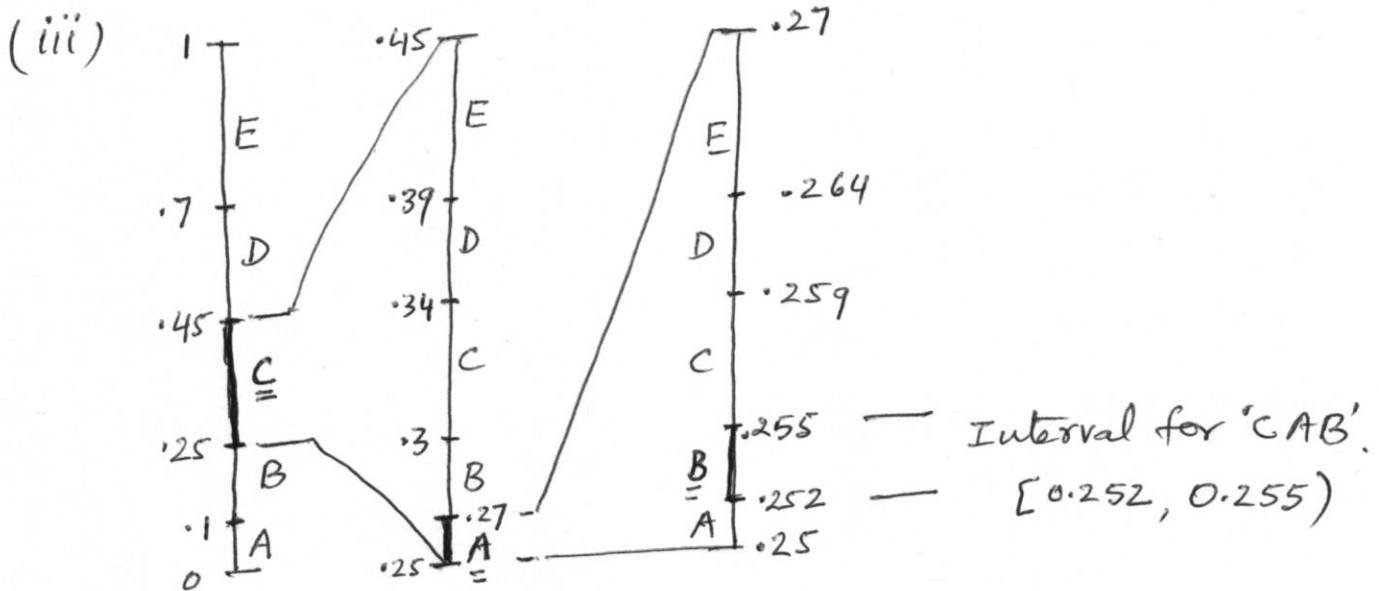# Midterm Sample Solution

Q1

(i) Self entropy of symbol $A = -\log_2 (0.1)$

$$= 3.32$$

(ii) Message Entropy $= -[0.1 \log_2 (0.1) + 0.15 \log_2 (0.15) + 0.2 \log_2 (0.2)$

$$+ 0.25 \log_2 (0.25) + 0.3 \log_2 (0.3)]$$

$$= -[0.1 \times 3.32 + 0.15 \times 2.74 + 0.2 \times 2.32 + .25 \times 2 + 0.3 \times 1.74]$$

$$= 2.23 \text{ bits/symbol}$$

(iii)

Interval for 'CAB'.
$[0.252, 0.255)$

Q2:

Bit rate

$$[(1920 \times 1080 \times 8) + 2 \cdot (960 \times 540) \times 8] \times 30$$

$$= 746.496 \text{ Mbps}$$

Total memory for storing 1.5 hr video

$$= \text{bit rate} \times \text{total time}$$

$$= (746.496 \times 10^6) \times (90 \times 60) \text{ bits}$$

$$= 503.8848 \text{ GB}$$

$\downarrow$ $\uparrow$ bytes
10^9