

Ans to the 4 no-1

- ① Each output from each source and one extra bit for synchronization.

$$\therefore \text{frame size } (20 \times 2) + 1 = 41 \text{ bits.}$$

- ② Each frame carries 2 bit from each source.

$$\begin{aligned} \text{Frame rate} &= \frac{100000}{2} \\ &= 50000 \text{ frame/s} \end{aligned}$$

$$\begin{aligned} \text{③ Output frame duration} &= \frac{1}{\text{frame rate}} \\ &= \frac{1}{50000} \\ &= 20 \mu\text{s} \end{aligned}$$

$$\begin{aligned} \text{④ Data rate} &= 50000 \text{ frames} \times 41 \text{ bits/frame} \\ &= 2.05 \text{ Mbps} \end{aligned}$$

Ans to the question no-02

$$\text{Bandwidth for each channel} = \frac{15 \text{ MHz}}{15} \\ = 100 \text{ KHz}$$

We know

$$B = (1+d)S$$

$$\Rightarrow B = (1+d) \frac{1}{\pi} \times N$$

$$\therefore \pi = \frac{2N}{B} \Rightarrow \frac{2 \times 1 \text{ Mbps}}{100 \text{ KHz}}$$

$$= 20 \text{ bits per baud}$$

Ans to the question no-3

a) The data rate of each source is 250×8
 $= 2000 \text{ bps}$
 $= 2 \text{ Kbps}$

b) each source sends 250 characters per second,

$$\therefore \text{The duration of a character is } \frac{1}{250} \\ = 4 \text{ ms}$$

③ Each frame has one character from each source, which means the link needs to send 250 frames per second to keep the transmission rate of each source.

④ The duration of each frame is the same as the duration of each character coming from each source. Therefore, the duration of each frame is 4 s.

⑤ Each frame carries 4 characters and 1 extra synchronization bit. This means that each frame is $(4 \times 8) \text{ bit} + 1$
 $= 33 \text{ bit}$

⑥ Link sends 250 frames per second. Each contains 33 bits.

$$\begin{aligned} \text{data rate of the link} &= 250 \times 33 \\ &= 8250 \end{aligned}$$

Ans to the question no. 4

allocate one slot to the first channel and two slots to the second channel. Each frame carries 3 bits

The frame rate 100000 frames per second because it carries 1 bit from the first channel. The frame duration is $\frac{1}{100000\text{s}} = 10\text{ ms}$.

The bit rate is 100000 frames \times 3 bits per frame
 $= 300000\text{ bps}$
 $= 300\text{ Kbps}$

Ans to the question no-5

We can combine six 200 Kbps sources into three 400 Kbps. Now have seven 400 Kbps channels.

(i) Each frame carries 1 bit from each of the seven 400 Kbps line.

\therefore Frame size = $7 \times 1 = 7$ bits.

(ii) Each frame carries 1 bit from each 400 Kbps source.

\therefore frame rate = 400000 frames per second.

$$(iii) \text{ frame duration} = \frac{1}{\text{frame rate}} = \frac{1}{400000} = 2.5 \mu s,$$

$$(iv) \text{ Output data rate} = (400000 \times 7) \text{ bps} \\ = 2.8 \text{ Mbps}$$