

Slide Examples Solutions

Lecture 9

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GSM Example-1

GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bits and data is transmitted over a channel at 270.833 kbps. Find (i) time duration of a bit, (ii) time duration of a time slot, (iii) time duration of a TDMA frame, and (iv) how long must a user wait when occupying a single time slot between two successive transmissions.

Solution: *Added from the Lecture Slide*

Solution

(i) To find time duration of a bit, T_b

Channel data rate = 270.833 kbps (given)

Time duration of a bit, $T_b = 1/\text{data rate}$

Hence, time duration of a bit, $T_b = 1/270.833 \text{ kbps} = 3.69 \text{ us}$

(ii) To find time duration of a time slot, T_{slot}

Number of bits per time slot = 156.25 bits (given)

Time duration of a time slot, $T_{\text{slot}} = 156.25 \text{ bits} \cdot T_b$

Time duration of a time slot, $T_{\text{slot}} = 156.25 \text{ bits} \cdot 3.69 \text{ us} = 577 \text{ us}$

(iii) To find time duration of a TDMA frame, T_f

Number of time slots per TDMA frame = 8 (given)

Time duration of a frame, $T_f = \text{number of time slots} \cdot T_{\text{slot}}$

Time duration of a frame, $T_f = 8 \cdot 577 \text{ us} = 4.616 \text{ ms}$

(iv) To find time duration for a user occupying a single time slot between two successive transmissions has to wait for the time duration of a frame.

Hence, a user has to wait for 4.616 ms between two successive transmissions.