



EEEN 462 – ANALOGUE COMMUNICATION

VESTIGIAL SIDEBAND MODULATION (VSB) – TEST YOUR KNOWLEDGE

MULTIPLE CHOICE QUESTIONS

1. **VSB stands for:**
 - a) Variable Sideband Suppression
 - b) Vestigial Sideband
 - c) Voltage-Scaled Bandwidth
 - d) Vector Sideband
2. **VSB is primarily a compromise between:**
 - a) AM and FM
 - b) DSB-SC and SSB
 - c) FM and PM
 - d) PCM and DM
3. **The key feature of VSB is:**
 - a) Complete suppression of one sideband
 - b) Transmission of a "vestige" of the suppressed sideband
 - c) Double bandwidth efficiency compared to DSB
 - d) Elimination of the carrier signal
4. **The typical bandwidth of a VSB signal is:**
 - a) Equal to the baseband signal bandwidth
 - b) Slightly more than the baseband bandwidth
 - c) Twice the baseband bandwidth
 - d) Half the baseband bandwidth
5. **VSB filtering is designed to satisfy:**
 - a) $|H(f_c + f_m)| + |H(f_c - f_m)| = \text{constant}$ $|H(f_c + f_m)| + |H(f_c - f_m)| = \text{constant}$
 - b) $H(f) = 0$ $H(f) = 0$ for $|f| > f_m$ $|f| > f_m$

- c) $H(f_c)=1$ and $H(-f_c)=1$
- d) Linear phase at all frequencies

6. The primary application of VSB is:

- a) FM radio broadcasting
- b) Analog television transmission
- c) Satellite communications
- d) Wi-Fi networks

7. For demodulating VSB, the following method is used:

- a) Envelope detection (with carrier)
- b) Frequency discrimination
- c) Phase-locked loop
- d) Slope detection

8. The vestige in VSB compensates for:

- a) Channel noise
- b) Non-ideal filter roll-off
- c) Carrier phase errors
- d) Multipath distortion

9. Compared to SSB, VSB:

- a) Requires more complex filters
- b) Has higher bandwidth efficiency
- c) Allows simpler filter design
- d) Is more susceptible to fading

10. In VSB, the carrier is typically:

- a) Fully suppressed
- b) Transmitted at reduced power
- c) Used for synchronization
- d) Replaced by a pilot tone

11. The roll-off characteristic of a VSB filter is often:

- a) Ideal brick-wall
- b) Raised cosine
- c) Butterworth
- d) Chebyshev

12. For a baseband signal of 4 MHz bandwidth, VSB bandwidth is approximately:

- a) 4 MHz
- b) 5 MHz
- c) 8 MHz
- d) 16 MHz

13. VSB outperforms SSB in transmitting signals with:

- a) High-frequency components
- b) DC or low-frequency components
- c) Phase discontinuities
- d) Frequency hopping

14. The main advantage of VSB over DSB-SC is:

- a) Lower transmitter power
- b) Higher noise immunity
- c) Reduced bandwidth
- d) Simpler receiver design

15. In analog TV, the VSB vestige occupies:

- a) 0.75 MHz of the suppressed sideband
- b) The entire lower sideband
- c) 25% of the upper sideband
- d) The carrier frequency band

16. VSB demodulation requires:

- a) Coherent detection only
- b) Envelope detection only
- c) Either coherent or envelope detection
- d) Asynchronous detection

17. The Nyquist slope in VSB filters refers to:

- a) The roll-off region around f_c
- b) The passband ripple
- c) The stopband attenuation
- d) The group delay characteristic

18. VSB is less sensitive than SSB to:

- a) Carrier frequency offsets
- b) Filter design imperfections

- c) Channel bandwidth
- d) Multipath interference

19. The power efficiency of VSB (with suppressed carrier) is:

- a) Higher than DSB
- b) Lower than SSB
- c) Equal to AM
- d) Unaffected by the vestige

20. A key disadvantage of VSB is:

- a) Poor low-frequency response
- b) Bandwidth wider than SSB
- c) Incompatibility with analog systems
- d) High implementation cost

TRUE/FALSE QUESTIONS

Indicate T (True) or F (False).

- 21. VSB requires coherent detection for demodulation.
- 22. The vestige allows VSB to use simpler filters than SSB.
- 23. VSB bandwidth is exactly equal to the baseband signal bandwidth.
- 24. Analog TV systems used VSB for video transmission.
- 25. VSB signals can be demodulated using a standard AM envelope detector.

SHORT ANSWER QUESTIONS

Answer concisely (1-2 sentences).

- 26. **Why is the vestige retained in VSB modulation?**
- 27. **Explain why VSB is preferred over SSB for analog TV signals.**
- 28. **Describe the symmetry condition for distortionless VSB demodulation.**
- 29. **What is the role of the Nyquist slope in VSB filter design?**
- 30. **State one advantage and one limitation of VSB compared to SSB.**

MODEL ANSWERS

MULTIPLE CHOICE QUESTIONS

1. b
2. b
3. b
4. b
5. a
6. b
7. a
8. b
9. c
10. b
11. b
12. b (e.g., 5 MHz for 4 MHz baseband in TV)
13. b
14. c
15. a
16. c
17. a
18. b
19. b (due to extra vestige power)
20. b

TRUE/FALSE

21. F (Envelope detection works with carrier)
22. T
23. F (Slightly larger than baseband)
24. T

25. T (With carrier present)

SHORT ANSWERS

26. **Vestige purpose:** Compensates for non-ideal filter roll-off and enables distortionless demodulation.

27. **TV preference:** VSB preserves low frequency/DC components (critical for video brightness) and allows simpler filters than SSB.

28. **Symmetry condition:** $|H(f_c + f_m)| + |H(f_c - f_m)| = \text{constant}$ $|H(f_c + f_m)| + |H(f_c - f_m)| = \text{constant}$ over the baseband.

29. **Nyquist slope:** Ensures linear phase and satisfies symmetry for distortion-less demodulation in the roll-off region.

30. **Advantage/Limitation:**

Advantage: Simpler filter design than SSB.

Limitation: Higher bandwidth than SSB due to vestige.