
Optical Amplifiers MCQ Questions



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MCQ Questions

1. Q What is the purpose of using repeaters in optical communication systems?

- (a) To convert optical signals to electrical signals
- (b) To amplify optical signals through electrical amplification and recreating
- (c) To attenuate optical signals for better receiver sensitivity
- (d) To convert electrical signals to optical signals

1. A (b)

2. Q Why are repeaters considered complex and expensive for high-speed systems?

- (a) They require frequent retiming, reshaping of signals, optical-to-electric and electric-to-optical conversions
- (b) They introduce additional loss in the optical fiber link
- (c) They have limited compatibility with different optical sources
- (d) None of the above

2. A (a)

3. Q Which component of the optical communication system is responsible for attenuating optical signals?

- (a) Optical sources
- (b) Photodetectors
- (c) Optical amplifiers
- (d) Optical fibers

3. A (d)

4. Q What is the main advantage of optical amplifiers in fiber communication systems?

- (a) They operate entirely in the optical domain, eliminating the need for electrical signal conversion.
- (b) They have been commercially available since the 1990s.
- (c) They can perform multiple functions simultaneously.
- (d) They provide high compatibility with different optical sources.

4. A (a)

5. Q Where is a power amplifier or booster typically located in a fiber communication link?

- (a) Immediately after the optical transmitter.
- (b) Along the fiber between the transmitter and the receiver.
- (c) Just before the optical receiver.
- (d) At the midpoint of the fiber link.

5. A (a)

6. Q What is the purpose of a pre-amplifier in a fiber communication system?

- (a) To increase the transmission power immediately after the optical transmitter.
- (b) To amplify the signal just before the optical receiver.
- (c) To increase the distance of transmission along the fiber.
- (d) To enhance the receiver sensitivity.

6. A (b)

7. Q How does an optical amplifier amplify the optical input signal?

- Ⓐ Through a feedback mechanism
- Ⓑ By converting the signal to an electrical form
- Ⓒ By utilizing a stimulated emission process without feedback mechanism
- Ⓓ By applying reflection coatings

7. A (c)

8. Q What is the role of the fiber-to-amplifier coupler in an optical amplifier?

- Ⓐ To convert the signal to an electrical form
- Ⓑ To provide feedback for amplification
- Ⓒ To amplify the signal through stimulated emission
- Ⓓ To apply the optical input signal to the active medium

8. A (d)

9. Q The gain is provided in the optical fiber by

- Ⓐ providing feedback from an external source.
- Ⓑ providing feedback from an internal source.
- Ⓒ pumping the active medium from an external source.
- Ⓓ pumping the active medium from an internal source.

9. A (c)

10. Q What is the purpose of the pump in an optical amplifier?

- (a) To convert the signal to an electrical form
- (b) To raise the electrons to higher energy levels
- (c) To trigger spontaneous emission process
- (d) To produce additional photons at higher wavelengths

10. A (b)

11. Q How does stimulated emission contribute to the amplification process in an optical amplifier?

- (a) It converts the signal to an electrical form
- (b) It produces additional photons at the same wavelength
- (c) It triggers the excited electrons to drop to higher levels
- (d) It supplies energy to the electrons in the active medium

11. A (b)

12. Q What are the characteristics of the amplified optical signal produced by an optical amplifier?

- (a) Different wavelength, random phase, opposite direction of travel
- (b) Same wavelength, random phase, opposite direction of travel
- (c) Same wavelength, same phase, same direction of travel
- (d) Different wavelength, same phase, same direction of travel

12. A (c)

13. Q How is the gain medium in a semiconductor optical amplifier (SOA) pumped?

- Ⓐ Optically
- Ⓑ Electrically
- Ⓒ Both optically and electrically

13. A (b)

14. Q Which type of optical amplifier is known for its higher compact size and relatively lower cost?

- Ⓐ Rare earth-doped fiber optical amplifier (DFA)
- Ⓑ Semiconductor optical amplifier (SOA)
- Ⓒ Raman fiber optical amplifier (RFA)

14. A (b)

15. Q Which rare earth element is typically used for amplifying wavelengths around 1.55 μm in optical fibers?

- Ⓐ Neodymium (Nd)
- Ⓑ Praseodymium (Pr)
- Ⓒ Erbium (Er)
- Ⓓ None of the above

15. A (c)

16. Q What is the wavelength range at which neodymium (Nd) doped fiber amplifies signals?

- (a) Around 1.06 μm
- (b) Around 1.3 μm
- (c) Around 1.55 μm
- (d) It does not amplify any specific wavelength

16. A (a)

17. Q What is the wavelength range at which Praseodymium (Pd) doped fiber amplifies signals?

- (a) Around 1.06 μm
- (b) Around 1.3 μm
- (c) Around 1.55 μm
- (d) It does not amplify any specific wavelength

17. A (b)

18. Q Why are erbium doped fiber amplifiers (EDFAs) the most widely used in fiber communication links?

- (a) They have the highest gain among all optical amplifiers.
- (b) They operate at the wavelength with minimum fiber loss.
- (c) They have a smaller spectrum compared to other amplifiers.
- (d) (a) and (b)

18. A (d)

19. Q What is the purpose of using isolators in the configuration of an EDFA?

- (a) To combine the pump light with the input signal.
- (b) To optimize the gain of the doped fiber.
- (c) To eliminate unwanted back reflections.
- (d) To minimize the length of the doped fiber.

19. A (c)

20. Q Which component in the EDFA configuration is responsible for combining the input signal with the pump light?

- (a) WDM coupler
- (b) Isolator
- (c) EDF amplifier
- (d) Output port

20. A (a)

21. Q At which wavelength can the Erbium doped fiber amplifier (EDFA) be excited to the state 2?

- (a) 980 nm
- (b) 1480 nm
- (c) 1550 nm
- (d) It cannot be excited to the state 2

21. A (a)

22. Q What happens to the Er ion when it is excited to state 2 by the pump light at 980 nm?

- (a) It immediately emits a photon at 980 nm.
- (b) It remains in state 2 indefinitely.
- (c) It quickly relaxes to state 1 by radiating heat.
- (d) It undergoes stimulated emission at 1550 nm.

22. A (c)

23. Q What process creates a population inversion in the Erbium doped fiber amplifier (EDFA)?

- (a) Photon emission from state 1 to the ground level
- (b) Photon absorption at 980 nm
- (c) Radiating heat from state 2 to state 1
- (d) Stimulated emission at around 1550 nm

23. A (c)

24. Q What is the active gain medium in semiconductor optical amplifiers (SOAs) typically made of?

- (a) Rare earth ions
- (b) Alloys of semiconductor elements from groups III and V
- (c) Erbium-doped fibers
- (d) Nonlinear crystals

24. A (b)

25. Q The SOAs function in the same way as a semiconductor laser with no or with very low feedback.

- ☐ (a) True
- ☐ (b) False

25. A (a)

26. Q How do SOAs achieve population inversion in the active region?

- ☐ (a) By externally pumping electrical injection current
- ☐ (b) By utilizing optical feedback
- ☐ (c) By exciting electrons with laser light
- ☐ (d) By heating the active region

26. A (a)

27. Q How do photons cause the excited electrons in SOAs to lose energy and amplify the signal?

- ☐ (a) By stimulating emission of additional photons
- ☐ (b) By scattering off the active region
- ☐ (c) By converting energy into heat
- ☐ (d) By exciting neighboring electrons

27. A (a)

28. Q Which type of semiconductor optical amplifier (SOA) utilizes cleaved facets as partially reflective end mirrors?

- (a) Fabry-Perot Laser Amplifier (FPA)
- (b) Traveling-Wave Semiconductor Laser Amplifier (TWA)
- (c) Both FPA and TWA
- (d) Neither FPA nor TWA

28. A (a)

29. Q How does an input optical signal get amplified in a Fabry-Perot Laser Amplifier (FPA)?

- (a) By direct injection of electrical current
- (b) Only once during a single pass through the active region.
- (c) By reflecting back and forth between the cleaved facets
- (d) By utilizing optical feedback from external sources

29. A (c)

30. Q In which type of semiconductor optical amplifier (SOA) does the input optical signal get amplified only once during a single pass through the active region?

- (a) Fabry-Perot Laser Amplifier (FPA)
- (b) Traveling-Wave Semiconductor Laser Amplifier (TWA)
- (c) Both FPA and TWA
- (d) Neither FPA nor TWA

30. A (b)

31. Q does not have any reflective facets, thus there is no optical feedback.

- Ⓐ Fabry-Perot Laser Amplifier (FPA)
- Ⓑ Traveling-Wave Semiconductor Laser Amplifier (TWA)
- Ⓒ Both FPA and TWA
- Ⓓ Neither FPA nor TWA

31. A (b)