

The Fiber Optic Association, Inc.

1-760-451-3655 Fax 1-781-207-2421
Email: info@foa.org http://www.foa.org

The FOA Reference Guide To Fiber Optic Network Design And Study Guide To FOA Certification

Answers To Chapter Questions

Chapter 1

True/False

Indicate whether the statement is true or false.

T 1. Fiber optic network designers must have knowledge of electrical power systems and hardware as well as communications design.

F 2. The first consideration for any network is choosing the proper fiber optic cable type.
Multiple Choice

Identify the choice that best completes the statement or answers the question.

D 3. Fiber optic network designers should have an in-depth knowledge of _____.

- A. Fiber optic components and systems
- B. Installation processes
- C. All applicable standards, codes and any other local regulations
- D. All of the above

A 4. The first requirement that must be considered for a new fiber optic project is _____.

- A. The customer's communications system requirements
- B. Where the cable plant will be run
- C. Whether it will be multimode or singlemode fiber
- D. The customer's budget

Chapter 2

True/False

Indicate whether the statement is true or false.

T 1. Optical fibers can transmit either voice, data or video and either analog or digital signals.

T 2. Singlemode fiber has a smaller core than multimode fiber.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

A 3. In an optical fiber, the light is transmitted through the _____.

- A. Core
- B. Cladding
- C. Buffer
- D. Jacket

___C_4. The diameter of an optical fiber is traditionally measured in _____.

- A. Meters
- B. Millimeters
- C. Microns (micrometers)
- D. Nanometers

___A_5. Loss of a fiber or any fiber in a cable is measured in _____.

- A. dB
- B. dBm
- C. milliwatts

___B_6. 10 dB corresponds to a factor of _____ in power.

- A. 2
- B. 10
- C. 20
- D. 100

___C_7. A fiber stripper removes the _____ of the fiber.

- A. Core
- B. Cladding
- C. Buffer coating

___D_8. The _____ protects the fiber from harm.

- A. Primary buffer coating
- B. Aramid fiber strength members
- C. Jacket
- D. All of the above

___C_9. The wavelength of light used for most fiber optic systems is in the _____ region and is _____ to the human eye.

- A. ultraviolet, invisible
- B. solar, visible
- C. infrared, invisible

Chapter 3

True/False

Indicate whether the statement is true or false.

- T_ 1. Any standard's main goal is to create uniform specifications for products that ensure interoperability among various manufacturer's products.
- T_ 2. Customers purchasing products generally do not need to depend on understanding the meaning of the standards themselves.
- T_ 3. Besides cabling, Ethernet and WiFi are examples of industry standards.
- F_ 4. Once written, standards never change.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- B_ 5. The goal of the TIA TR-42 committee is to produce a _____ for cabling that manufacturers can use for developing communications products.
- A. Standard nomenclature
 - B. Predictable minimum performance level
 - C. Application
 - D. Test spec

Chapter 4

True/False

Indicate whether the statement is true or false.

- T_ 1. The biggest advantage of optical fiber is the fact it is the most cost effective means of transporting information.
- F_ 2. Telephone networks have been converted to fiber, including long distance and metropolitan networks, but fiber to the home (FTTH) is not yet feasible.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- A_ 3. Today, with the exception of some _____, the entire telephone backbone is fiber optics..
- A. Rugged or remote locations
 - B. Ultra-high speed connections
 - C. Large cities
 - D. Triple play systems
- B_ 4. _____ companies "overbuild with fiber, often lashing fiber optic cables to installed aerial coax cable.
- A. Independent telephone
 - B. CATV
 - C. Utilities
 - D. Private network

___B_5. Copper networks can be converted to fiber optics using _____.

- A. Fiber hubs
- B. Media converters
- C. Patch panels
- D. Rewiring

Multiple Response

Identify one or more choices that best complete the statement or answer the question.

___B,C_6. The bandwidth and distance capability of optical fiber means that _____. (choose all that apply)

- A. Fewer cables are needed
- B. Fewer repeaters are needed
- C. Less power is consumed by the network
- D. Less maintenance is required

___ALL_7. Which of the following communications systems typically use fiber optic backbones? (choose all that apply)

- A. Telephones
- B. CATV
- C. Internet
- D. Cell Phones

Chapter 5

___D_1. Outside plant cabling can be installed by _____.

- A. Pulling in underground in conduit
- B. Direct burial
- C. Aerial suspension
- D. All of the above

___C_2. Underground cable generally includes a gel for protection from _____.

- A. Pulling friction
- B. Lightning strikes
- C. Moisture
- D. Fiber abrasion

___A,B_3. Armored cable is used in outside plant installations to _____.

- A. Prevent rodent damage
- B. Protect from rock damage
- C. Increase pulling tension
- D. Conduct lightning strikes

___T_4. True or false: Most outside plant installations are singlemode fiber.

___B_ 5. Concatenation or the joining of two cables in a long outside plant run is almost always done by _____.

- A. Mechanical splicing
- B. Fusion splicing
- C. Field installation of connectors
- D. Splicing on pigtailed connectors

___A_ 6. Premise cables in LAN backbones often contain _____.

- A. Only multimode fiber
- B. Only singlemode fiber
- C. Both multimode and singlemode fiber
- D. Plastic optical fiber

___D_ 7. Premises cables must be rated for _____ to meet codes.

- A. Pull strength
- B. Bend radius
- C. Weight in cable trays
- D. Fire retardance

___B_ 8. Underground cable refers to a cable that is _____.

- A. Buried in a trench
- B. Pulled in underground conduit or ducts
- C. Armored
- D. Waterproof

___A_ 9. Direct buried cable refers to a cable that is _____.

- A. Buried in a trench
- B. Pulled in underground conduit or ducts
- C. Armored
- D. Waterproof

___D_ 10. Cable should be buried at a depth _____.

- A. Required by local building codes
- B. Deep enough to prevent easy dig-ups
- C. Determined by other cables with conflicting routing
- D. Any or all of the above

___A_ 11 Microtrenching refers to cables _____.

- A. Buried in grooves sawed in roadways
- B. Placed in small ducts inside conduit
- C. Pulled in ducts poured inside concrete
- D. Connecting microcomputers

___C_ 12. Direct buried cables generally have armor to prevent rodent damage and _____.

- A. Make the cable strong enough to pull
- B. Stiffen the cable
- C. Prevent damage from the material used to fill the trench
- D. Allow the cable to be made smaller in diameter

___D_ 13. Splices for underground cables can be _____.

- A. Buried underground in splice closures
- B. Placed in vaults buried on the cable route
- C. Placed in pedestals above ground
- D. Any or all of the above

___D_ 14. The most common cause of failure of underground cable is _____.

- A. Lightning
- B. Gophers
- C. Earthquakes, volcanoes and other natural disasters
- D. Backhoe fade (accidental dig-ups)

___D_ 15. When installing direct-buried or underground cables, the first thing you should do is _____.

- A. Inspect the work site
- B. Rent the heavy equipment you need
- C. Decide what kind of cable to order
- D. Call "Call Before You Dig" at "811" or go to "www.call811.com"

___A_ 16. The biggest issue with aerial cable design is to ensure the cable is able to withstand the _____ over the long term.

- A. Tension on the cable
- B. Weight
- C. Wind
- D. Ice and rain

___D_ 17. TIA 568 standards for premises or structured cabling including network architectures and cable lengths were derived from _____.

- A. Intense industry debates
- B. New research from standards committee members
- C. IEEE Ethernet standards
- D. AT&T designs for PBXes (telephone private switches and cabling)

___A_ 18. TIA 568 limits unshielded twisted pair (UTP) cables to _____ meters total length, including a maximum of _____ meters of flexible patchcords.

- A. 100, 10
- B. 90, 10
- C. 100, patchcords can be as long as needed
- D. There is no limit to lengths

___T_ 19. The connector used for all UTP cables is often called an RJ-45 but is technically a modular 8-pin connector.

- True
- False

___A_ 20. Category-rated UTP cables are specified by performance to allow _____.

- A. Choosing a proper cable for the speed of the network
- B. Running longer distances with higher performance cables
- C. Make more link connections in higher performance cables
- D. Easier installation without worrying about connectors affecting performance

___D_ 21. Fiber optic cable is often used in premises cabling for network backbones because _____.
A. It allows longer backbone run lengths
B. It is immune to electrical interference
C. It has more bandwidth for higher speeds and upgrades
D. All of the above

___B_ 22. You should not mix UTP and fiber optic cable in the same cable tray because _____.
A. Copper cable is not flame retardant
B. The copper cable is much heavier and can crush the fiber optic cable
C. The copper cable can interfere with signals in the fiber optic cable
D. It makes it hard to identify cables when testing

Chapter 6

___D_ 1. Cabling in a communications project _____.
A. Creates the infrastructure for communications
B. Meets the codes and standards required
C. Must be properly designed, installed and tested
D. All of the above

___T_ 2. Cabling may only be a few percent of the cost of a communications system but causes most of the problems.
True
False

___D_ 3. The first thing to consider when planning a cabling project is _____.
A. The route the cable must follow
B. The environment the cable must be installed in
C. The cost of the cabling
D. The needs of the communications system(s) using the cabling

___C_ 4. Standards are written to ensure that cabling _____.
A. Is a commodity and costs as little as possible
B. Is not counterfeit
C. Performs adequately for the systems using it
D. Meets local laws

___D_ 5. Codes related to cabling _____.
A. Ensure fire and electrical safety
B. May require inspections
C. Are generally covered by local laws
D. All of the above

___D_ 6. Copper, fiber or wireless?
A. Copper because it's cheaper
B. Fiber because it's faster
C. Wireless because it allows mobility
D. Which ever makes sense for the communications system(s)

___D_ 7. When choosing a contractor, the most important issue is NOT _____.
A. Relevant experience
B. Proper training and certification
C. Good references
D. Whoever makes the lowest bid

___A_ 8. When abandoned cable is found inside a building, _____ and _____.
A. It should be removed to meet the NEC requirements
B. Connections should be cut off to reduce confusion
C. It can be used to support new cables
D. It must be recycled

___D_ 9. The first thing to consider when planning an installation is _____.
A. Minimize labor hours
B. Make sure you have enough cable and connectors
C. Ensure all workers have walked the cable routes
D. Safety

___B_ 10. After defining the project, as the design begins, the first thing to create is the _____.
A. CAD drawings
B. Documentation
C. Bills of material
D. Estimates

Chapter 7

True/False

Indicate whether the statement is true or false.

___T_ 1. Documentation includes all information on the cable plant project plus marking and labeling appropriate components, with copies provided to the customer and backups arranged.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

___A_ 2. Paperwork for a fiber optic project should be started _____.
A. As soon as the project starts
B. Once the link is designed
C. Before installation begins
D. Before testing is done
E. After the project is completed
F. When the customer demands it

Matching

Match the document to its definition.

- A. Scope of Work (SOW)
- B. Request for Proposal (RFP)
- C. Request for Quote (RFQ)

D. Contract

- __D__ 3. A legal document between the contractor and the customer specifying the requirements of the project.
- __C__ 4. Invitation to suppliers to join into a bidding process for specific products or services.
- __A__ 5. Describes the work to be performed or the services to be provided by a contractor.
- __B__ 6. Invitation for suppliers to submit a proposal on a specific co

Chapter 8

True/False

Indicate whether the statement is true or false.

- __T__ 1. The routing or location of the fiber optic cable plant being designed is the primary issue which will determine the types of components chosen.
- __F__ 2. Direct burial cable and underground cable are the same.
- __T__ 3. All cables installed indoors must meet flammability standards determined by local building codes.
- __C__ 4. Most OSP singlemode cable is spliced using _____.
- A. SC Connectors
 - B. LC Connectors
 - C. Fusion Splicing
 - D. Mechanical splicing
- __D__ 5. Most singlemode fiber is terminated by _____.
- A. Epoxy/polish connectors
 - B. Prepolished/splice connectors
 - C. Crimp connectors
 - D. Fusion spliced pigtails
- __B__ 6. The most popular tight-buffered cable used in premises application is _____, because it has more fibers in a smaller cable.
- A. Zipcord
 - B. Distribution
 - C. Breakout
 - D. Loose Tube

Chapter 9

___ T_1. A loss budget is the calculated loss of the cable plant while a power budget is the optical loss tolerable to a communications system.

- True
- False

___ D_2. Loss budgets are used to ensure _____.

- A. The network design will work with the chosen communications equipment
- B. Losses of components chosen are appropriate for the cable plant
- C. The cable plant tests have a comparison for pass/fail decisions
- D. All of the above.

___ E_3. When calculating the loss budget of a cable plant, you total the losses of all the _____ in the link.

- A. Fiber attenuation
- B. Connections
- C. Splices
- D. Passive devices
- E. All of the above

___ C_4. When calculating the loss budget, you should choose the component losses using _____.

- A. Loss values from industry standards that are always worst case
- B. Typical losses that are generally lower than standards
- C. Either typical or standard losses as long as it's documented in the design
- D. Lowest possible losses so the cable plant loss budget looks better

___ C_5. You calculate the contribution of the loss of the fiber to the loss budget by _____.

- A. Looking up the attenuation of the fiber on a manufacturer's data sheet
- B. Dividing the length of the fiber by the attenuation
- C. Multiplying the length of the fiber by the attenuation coefficient
- D. Choosing the best loss possible

___ D_6. When calculating the contribution of the fiber loss to the loss budget, you must consider the _____.

- A. Size of the fiber
- B. Type of cable
- C. Termination of the fiber
- D. Wavelength of the light in the fiber

___ A_7. Connector losses are calculated by adding up all the losses of the connectors, always _____.

- A. Including the connectors on each end of the cable plant
- B. Including the connectors on each end of the cable plant only if they are connected to a patchcord
- C. Excluding the connectors on each end of the cable plant
- D. Excluding the connectors on each end of the cable plant if the cable is connected directly to a transceiver

___ B_8. A premises cabling link 100 meters long uses multimode fiber (3.0 dB/km @ 850nm) and two connections in the middle as well as two connectors on the ends (0.50 dB/connector). The calculated loss budget would be _____.

- A. 1.30dB
- B. 2.30dB
- C. 3.30dB
- D. 5 dB

___ C_9. Recalculate the loss budget of the premises cabling link above (100m with 2 connections and connectors on each end) using TIA 568 worst case component losses (fiber at 3.5dB/km and connections at 0.75dB). Then the loss budget now becomes _____.

- A. 1.35dB
- B. 1.85dB
- C. 3.35dB
- D. 6.50dB

___ D_10. When comparing calculated loss budgets to test values of the installed cable plant in the field to determine whether an installation is acceptable, it's important to remember _____.

- A. The loss budget is an estimate
- B. The test results have some errors
- C. The operator must use judgment when the loss measured is close to the loss budget
- D. All of the above

Chapter 10

___ A,D_1. For testing a terminated fiber optic cable or a patchcord, the instrument(s) you need is (are):

- A. FO power meter and source
- B. Visual Fault Locator
- C. Optical Continuous Wave Reflectometer
- D. Optical Time Domain Reflectometer

___ D_2. The correct way to calibrate "0 dB" or no loss is with:

- A. One reference cable for launch
- B. Two reference cables, one for launch and one for receive
- C. Three reference cables including a "golden" cable
- D. Any of the above as long as the method is documented

___ B_3. Mixing 50/125 micron fiber with 62.5/125 fiber can cause:

- A. Excess loss when coupling from 50/125 to 62.5/125 fiber.
- B. Excess loss when coupling from 62.5/125 to 50/125 fiber.
- C. Gains when coupling from 62.5/125 to 50/125 fiber.
- D. There is no problem coupling these two fibers.

___ D_4. If testing shows high loss in a cable, the fault can often be found by:

- A. Inspecting the connectors with a microscope for scratches or cracks
- B. Testing the cable using the single-ended method in both directions
- C. Cleaning all connectors and retesting
- D. All of the above

___ C_5. The biggest factor in the uncertainty of loss measurements in multimode fiber is:

- A. The quality of the instruments being used
- B. The specifications of the reference test cables

- C. The mode power distribution caused by the test source
- D. The resolution of the measurement

___B_ 6. An OTDR can be used to find bad connectors or splices in a high loss cable plant, if the OTDR has:

- A. Sufficient gain
- B. Sufficient resolution
- C. Long wavelength capability
- D. A built-in mode scrambler

___A_ 7. If an OTDR cannot find the problem, a _____ may solve the problem.

- A. Visual fault locator
- B. Fiber Tracer
- C. OCWR
- D. Microscope

___A,B,D_ 8. OTDRs can measure _____, _____ and _____. (3 correct answers)

- A. Distance
- B. Attenuation
- C. Optical power
- D. Reflection

___T_ 9. True or False: Length measurements by the OTDR are longer than the actual cable because the fiber is longer than the cable itself.

___D_ 10. OTDR connector or splice loss measurements are only accurate if you _____.

- A. Put index matching fluid on the connector
- B. Use reference quality connectors
- C. Have a matching launch cable
- D. Test both ways and average the reading

Chapter 11

True/False

Indicate whether the statement is true or false.

- ___F___ 1. Once the design of a fiber optic project is complete and documented, the bulk of the work is done.
- ___T___ 2. While the Project Manager is the most important person in the project, there must be a backup person so there is a contact available, often 24/7, during the project.
- ___F___ 3. It is not necessary for the on-site supervisor to inspect and verify test results until the final stage of the project.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

___D_ 4. Planning a project properly includes creating a _____ before beginning the design process.
A. Notebook
B. CAD drawings
C. List of responsible personnel
D. Checklist

___C_ 5. _____ determines that the project was installed correctly.
A. The sign-off by the project manager
B. Completion of the last installations
C. Test data showing all links properly installed
D. Acceptance by the customer

___D_ 6. The most important thing you can have when trying to restore a fiber optic network is _____.
A. OTDR
B. Visual fault locator
C. Truck
D. Documentation

Multiple Responses

Identify one or more choices that best complete the statement or answer the question.

___ALL_ 7. _____ During the project, it may be necessary to work with _____ to complete the project.
(Check all that apply)
A. Architects and engineers
B. City or county permit authorities
C. Persons or organizations whose property may be affected
D. Electrical contactors
E. Electrical inspectors
F. Building inspectors
G. Local licensing authorities
H. Certification organizations like FOA

___ALL_ 8. _____ To do a proper restoration on a buried OSP cable, you are going to need the following equipment and supplies in addition to the documentation.(Check all that are necessary)
A. Fiber toolkit, including mechanical or fusion splicer
B. Sufficient lengths of fiber
C. One or two splice closures
D. Appropriate test equipment