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. Aramide 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
B. 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
4. True or false: Most outside plant installations are singlemode fiber.

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

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

7. Premises cables must be rated for ______ to meet codes.
   A. Pull strength
   B. Bend radius
   C. Weight in cable trays
   D. Fire retardance

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

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

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

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

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
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

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)

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”

16. The biggest issue with aerial cable design is to ensure the cable is able to withstand the _______.
   A. Tension on the cable
   B. Weight
   C. Wind
   D. Ice and rain

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)

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

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

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
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

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

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Chapter 6

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

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

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

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

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

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)
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

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

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

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.

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.

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 connector
   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 ____________

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

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

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

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

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

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.

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

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

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

7. If an OTDR cannot find the problem, a ____________ may solve the problem.
   A. Visual fault locator
   B. Fiber Tracer
   C. OCWR
   D. Microscope

8. OTDRs can measure __________, __________ and __________. (3 correct answers)
   A. Distance
   B. Attenuation
   C. Optical power
   D. Reflection

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

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.
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

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

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.*

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

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