Broadband RF System Design and Installation

Version 2.0 03/20/06

How to Use This Exam

This exam is intended to measure your understanding of the material presented in the Broadband RF course. The exam consists of 50 questions taken from the material presented in the course and all answers can be found either in the video or in the course workbook. The questions generally follow the order of the material presented in the course.

This is an open book, open video exam. You are encouraged to look for answers in the workbook and the video, therefore it is assumed that you will be able to review the video while you are taking the test.

Taking the Exam

• The recommended time limit for taking the exam is 2 hours.

• The minimum passing score is 74% (37 answers correct).

• It is best to take the exam shortly after viewing the video and reviewing the material in the Workbook. Review the portion of the DVD that corresponds to the section of the exam being worked on.

Signing the Exam

In order to be eligible for a Certificate of Completion, you must sign the exam stating the you have taken the exam without the assistance from anyone else.

Feedback

If you have questions about any of the items in the exam, please contact us at grayson@trainingdept.com. We will update the exam from time to time to reflect corrections and clarifications.

Broadband RF System Design and Installation

Name _____

I certify that I have taken this exam without assistance from anyone.

Signature _____ **Date** _____

Enter the address you would like us to mail your Certificate

_____

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Directions
Each of the questions or incomplete statements listed below is followed by possible answers. Read each question carefully and completely before you attempt to answer it. Choose the answer that you believe BEST answers the question or completes the statement and circle that answer directly on this sheet.

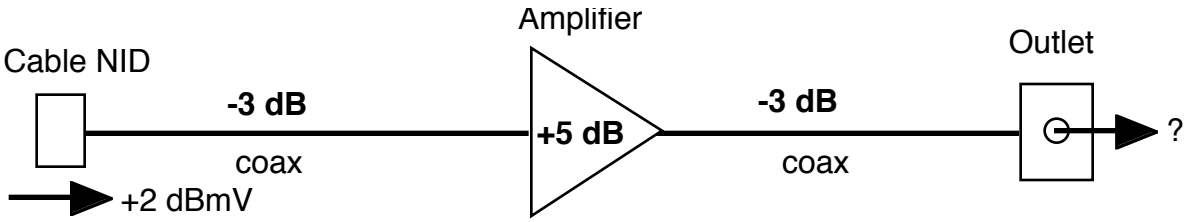
Cable Signals and Signal level Requirements

1. If we know the loss in a length of coax cable at 800 MHz is –6 dB, then a cable television signal at 800 MHz of 1 volt connected to one end of the cable will measure _____ at the other end of the cable (assuming the cable is properly terminated).
   a. 0.25 volt
   b. 0.5 volt
   c. –0.5 volt
   d. –1.6 volt

2. FCC Part 76 states that the maximum signal level on any channel at the customer receiver shall _____
   a. not exceed the input signal level of the receiver
   b. not exceed +15 dBmV
   c. be such that signal degradation due to overload does not occur
   d. be at least +3 dBmV

3. FCC Part 76 states that the hum level on any channel shall not exceed _____
   a. + 15 dBmV
   b. 3% of the visual carrier level
   c. the input signal level of the receiver
   d. the visual carrier level by +15 dBmV

4. A +6 dBmV signal is approximately equal to a _____
   a. 2.0 millivolt visual carrier
   b. 3.15 microvolt visual carrier
   c. 3.15 millivolt audio carrier
   d. +2 dB visual carrier



5. If we know the signal level of channel 27 is +2 dBmV at the cable NID (see diagram above), then given the gain and loss of the coax and amplifier shown (at channel 27), what will be the signal level at the outlet.

a. +1 dBmV
b. –1 dBmV
c. –3 dBmV
d. +2 dBmV

6. If we know the signal voltage into an RF amplifier is 1 volt and the output voltage is 10 volts, we know that the amplifier has an approximate gain of _____

a. 16 dB
b. 10 dB
c. 20 dB
d. 6 dB

7. Cable companies use the spectrum _____ for upstream or reverse channel service from the home back to the cable plant.

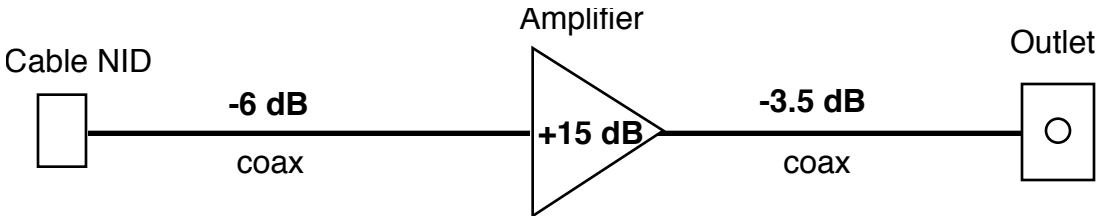
a. between channel 96 and 99
b. between channel 6 and 7
c. above channel 150
d. below channel 2

8. A "digital" cable television channel consists of _____

a. a 6 Mbps digital carrier containing an MPEG data stream
b. several MPEG encoded data streams transmitted in digital form
c. several 6 MHz NTSC channels
d. an analog carrier modulated with a digital data stream

9. A standard NTSC television channel contains _____

a. a video carrier 1.25 MHz above the lower edge of the channel
b. a croma carrier 4.5 MHz above the video carrier a video carrier
c. a croma carrier 1.25 MHz above the video carrier
d. a video carrier, and a digital sub-carrier



10. The diagram above shows the gain and loss of two lengths of coax and a distribution amplifier at 800 MHz. What is the overall gain or loss from the cable NID to the outlet?

a. –19.5 dB
b. +5.5 dB
c. –9.5 dB
d. +9.5 dB

Coax Cable and Connectors

11. The DC loop resistance for a 200 ft. length of quad RG6 with a copper-clad steel center conductor is about _____

a. 3.35 ohms
b. 33.5 ohms
c. 2.5 ohms
d. 7 ohms

12. The signal loss in a 200 ft. length of typical RG6 cable at 300 MHz is about _____

a. –4 dB
b. –8 dB
c. –5.5 dB
d. –14 dB

13. The signal loss in a 100 ft. length of typical RG6 is _____ the loss in a 100 ft. length of RG11.

a. more than
b. less than
c. about the same as
d. equal to

Off-air Signals and Antennas

14. One disadvantage of the antenna in the photo above is _____
    a. it is not possible to separate out the UHF and VHF channels
    b. it is susceptible to multi-path signals
    c. it is much harder to align
    d. the UHF and VHF stations must be in the same general direction

15. Multi-path interference is caused by signals at the channel frequency the TV receiver is tuned to that _____
    a. are absorbed by nearby interfering devices and arrive at the receiving antenna slightly delayed in time
    b. are generated by nearby interfering devices and arrive at the receiving antenna at lower amplitude
    c. are reflected from nearby objects and arrive at the receiving antenna slightly delayed from the transmitter signals
    d. are reflected from nearby objects and arrive at the receiving antenna slightly ahead of the transmitter signals

16. To receive DTV channels, you need to install _____
    a. a UHF antenna
    b. a combination UHF/VHF yagi
    c. an antenna designed for DTV reception
    d. a UHF log-periodic antenna.

17. In general, the more elements an antenna has, the greater the _____
    a. size
    b. bi-directivity
    c. bandwidth
    d. gain

Direct Broadcast Satellite Systems

18. The signal loss from the LNB to the satellite receiver input should not exceed _____
    a. 20 dBmV
    b. 20 dB
    c. +3 dBmV
    d. –55 dB

19. If the length of a coax cable run from a DISH Pro antenna to a DISH receiver is estimated to be 155 ft. You should use _____
    a. RG11 cable
    b. either RG6 or RG11, both will work fine
    c. RG6 cable
    d. RG11 to the distribution center, and RG6 from their to the receiver

20. For a DirecTV LNB, the two different voltage levels supplied to the LNB on the coax cable are used to select _____
    a. different satellites at an orbital position
    b. a specific transponder
    c. a specific orbital position
    d. the left or right hand polarized signals from the satellite transponders

21. The 22KHz DiSEqC signaling sent from the satellite receiver to a DISH Pro antenna is used to select
    a. the left or right hand polarized signals from the satellite transponders
    b. a specific transponder
    c. the output from a specific LNB
    d. a different output block of frequencies

Distribution System Components and Characteristics

22. In your latest installation, you will need a modulator for a DVD player. You calculate you will need an output signal level of at least +25 dBmV. You compare the specs of two different modulators from two different manufacturers.

Modulator A

Output channels: UHF 14-69, Cable 70-125
Output signal level: +25 dB
Frequency stability: +/- 5 KHz
C/N ratio: 60 dB

Modulator B

Output channels: UHF 14-69, Cable 14-150
Output signal level: +35 dB
Frequency stability: +/- 4 KHz
C/N ratio: 50 dB

Assuming the price of each amp is about the same, and other features are similar, which one is the better choice?

a. either modulator will work fine
b. neither modulator is right for the application
c. modulator A
d. modulator B

23. In your latest installation, you calculated you need an amplifier with +18 dB of gain for the distribution of cable television service in the home. You compare the specs of two different amplifiers from two different manufacturers.

Amplifier A

Gain: +20 dB
Bandwidth: 50 – 900 MHz
NF (noise figure): 3 dB
Max. input signal level: +25 dB

Amplifier B

Gain: +30 dB
Bandwidth: 50 – 900 MHz
NF: 6 dB
Max. input signal level: +30 dB

Assuming the price of each amp is about the same, which one is the better choice?

a. amplifier B
b. amplifier A
c. either amp will work fine
d. neither amp is right for the application

24. Terminators must be used _____

a. to reduce the output signal level from an amplifier or modulator
b. on the output of an attenuator
c. on the unused outputs or inputs of a splitter or combiner
d. to terminate the job quickly and efficiently

25. The reason frequency agile modulators require two channels of bandwidth is _____

a. because they output both sidebands of a modulated TV carrier
b. because they output two channels at one time
c. because they don't use the same guard band as cable signals
d. still a mystery

26. A band-stop filter (or notch filter) _____

a. is the opposite of a band-go filter
b. stops a range of frequencies above a specified band
c. blocks a range of frequencies below a specified range
d. blocks a range of frequencies

27. A diplexer can be used _____
    a. to combine the output of two different satellite LNBs
    b. in place of a 2-way splitter (they do the same thing)
    c. to combine two different ranges of frequencies onto a single cable
    d. when you need to combine two signals onto a single cable

28. The difference between a splitter and a tap is _____
    a. a tap divides a signal unevenly between its output ports
    b. a splitter is bi-directional and a tap is not
    c. a tap is always self-terminating
    d. a splitter can be used to divide DC voltage, a tap can't

29. You can incorporate off-air service with cable service for your customer by _____
    a. using a low-pass filter and splitter in the distribution center to combine both services onto one cable
    b. providing both services at each outlet and using separate inputs (cable, antenna) on the receiver or using an A/B selector switch
    c. using a diplexer in the distribution center to combine the two and at each TV receiver
    d. providing both services at each outlet and using a diplexer connected to the receiver

30. One of the reasons for developing a channel allocation plan is to determine _____
    a. which channels in-home modulated sources will be assigned
    b. which local channels are available
    c. which channels have HD content
    d. if you can use an off-air antenna for HD channels

31. On your latest installation, you need to use three in-home modulators. The customer is using a cable channel plan and the cable service uses channels 2-70 for analog channels and 71-125 for digital channels. There are no unused channels. You have a choice of using a band-stop filter to remove channels 61-68 or channels 71-78. Which would be the better choice.
    a. Either filter will work fine
    b. 71-78, because digital channels are easier to remove
    c. 61-68, because the lower the channel numbers you remove, the better
    d. 61-68, because these are analog channels

32. Which of the following signal sources will have the widest variation in signal level?
    a. Off-air signals
    b. Modulator signals
    c. Cable company signals
    a. Satellite signals

33. The station list that the CEA antenna web site produces generally lists stations broadcasting DTV near the top, requiring smaller antennas. Why?

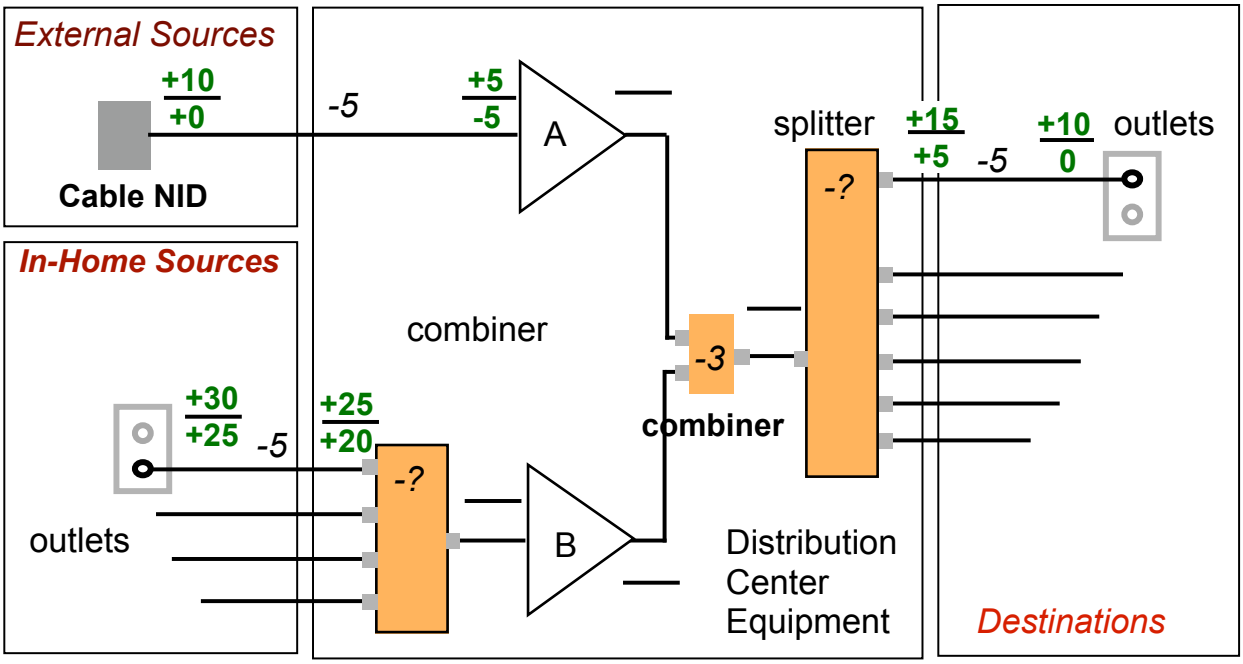
a. The output amplitude of DTV antennas is higher than equivalent analog antennas and therefore they can be made smaller
b. The digital output from DTV stations travels further than analog signals.
c. DTV stations are usually newer and broadcast more power than analog stations.
d. DTV receivers require less signal strength to successfully decode the digital content of DTV signals.

34. When distributing FM radio signals to several FM receivers, you should try to keep the minimum signal level of the stations the customer wants to receive above _____

a. 5000 µV
b. 500 µV
c. 50 µV
d. 5 µV

35. Which of the following is NOT a recommended installation planning step for a broadband RF distribution system.

a. Perform the system gain and loss calculations
b. Determine the source signal levels and required destination signal levels
c. Specify the RF distribution equipment
d. Determine the satellite orbital positions needed



36. The above diagram is similar to the one in the video and in your workbook for a typical RF distribution system except there are only 6 outputs (external cables), and 4 internal inputs. Use the signal level of the sources and required levels at the outlets

shown in the diagram to fill in the missing values for the loss in the splitters/combiners and at each point were the values are missing.

The max/min output (in dBmV) required for the source amplifier (A) should be _____

a. +24/+14
b. +27/+17
c. +21/+11
d. +29/+19

37. The max/min (in dBmV) that will be at the INPUT to internal amplifier (B) should be _____

a. +18/+13
b. +19/+9
c. +14/+9
d. +27/+22

38. When combining in-home modulated sources with off-air signals, a low-pass filter should be used between the _____ and _____

a. off-air antenna, distribution amplifier
b. modulators, external cable splitter
c. modulators, distribution amplifier
d. off-air antenna, external cable splitter

39. The low-pass filter used above is used to _____

a. block noise from the modulators from interfering with the off-air signals
b. prevent noise pickup from the antenna from interfering with the modulator channels
c. prevent unused TV channels from getting to the TV receivers
d. block modulator lower sidebands from interfering with the off-air signals

40. You perform a site survey at your latest job using a medium size UHF yagi antenna that you plan on installing and find the following signal levels:

Channel	Signal level
18 (digital)	-12 dBmV
22	-15 dBmV
27	+10 dBmV
29 (digital)	+5 dBmV
31 (digital)	-20 dBmV
35	-5 dBmV
40 (digital)	+8 dBmV

Which channels do you feel confident you can receive with a good picture (minimum noise or pixel errors)?

a. 18, 22, 29, 35
b. 18, 27, 29, 40
c. 27, 29, 35, 40
d. 27, 29, 40

41. At the site of your latest installation, you find that the stations you want to receive are in the following directions from the site:

Channel	Direction
18 (digital)	87°
22	268°
27	271°
29 (digital)	94°
31 (digital)	94°

To receive all the stations you could _____

a. use two directional UHF antenna (one pointed east, the other west) and combine their output with a UHF/UHF diplexer
b. use a uni-directional UHF antenna with a rotator
c. a or b will work
d. use a single bi-directional antenna

42. Initial testing of the RF distribution system, with the signal generator attached to the external signal input (cable/off-air) set to about +5 dBmV, showed that the highest signal level occurred in the guest room outlet (+6.5 dBmV at Ch. 14). This level indicates there may be a problem if the external signal _____

a. from an off-air station exceeds about +18 dBmV
b. from a cable provider and exceeds +10 dBmV
c. is ever below –10 dBmV
d. from a cable provider exceeds +5 dBmV at channel 14

43. In your latest project, you are using a modular amplifier with 8 outputs. After the installation is complete, and cable service is connected and operating, you measure the signal level on channel 75 at all 8 outlets. Your results look like:

OUTLET	Visual signal level
1	+8 dBmV
2	+4 dBmV
3	+16 dBmV
4	+3 dBmV
5	+10 dBmV
6	+7 dBmV
7	+2 dBmV
8	+7 dBmV

The results you got at channel 2 were only slightly higher.

Based on these results you should probably _____

a. use a tilt compensator on the cable to outlet 7
b. use an attenuator (-3 dB) on the amplifier module cable input
c. use an attenuator (-6 dB) on the cable to outlet 3
d. adjust the amplifier gain down by 6 dB

44. When planning your prewire to a roof location, you should plan for a minimum of six RG6 (or better) coax cables:

a. 3 for satellite dish, 1 for off-air antenna, 1 for a rotator, 1 for FM antenna
b. 2 for satellite dish, 2 for off-air antennas, 1 for a rotator, 1 for FM antenna
c. 4 for satellite dish, 2 for off-air antennas
d. 4 for satellite dish, 1 for off-air antenna, 1 for FM antenna

45. Alignment of a satellite dish is typically done by obtaining the highest signal strength in _____ then _____

a. tilt, azimuth
b. azimuth, elevation
c. c elevation, azimuth
d. elevation, tilt

46. At our project house, the UHF/VHF combiner (or diplexer) that was used on the off-air antenna installation _____

a. prevents unwanted signals from being radiated by the antennas
b. allows both antennas to share the same feed cable voltage
c. combines the two antenna outputs while blocking VHF signals from the UHF antenna and UHF signals from the VHF antenna.
d. contains a low-pass filter for the UHF input and a high-pass filter for the VHF input

47. When we tested signal levels at the project house, if we had found that the signal level of just one of the camera modulators was too high (rather than all of them), we could have _____

a. attached the coax cable from the camera whose output was too high directly to an internal signal input jack.
b. used an attenuator on the camera module output to achieve a compromise level between the highest and lowest camera output level.
c. used an attenuator with a DC blocking capacitor between the camera module and the coax cable to that camera.
d. used an attenuator between the camera module and the coax cable to that camera.

48. The RF Network diagram used for the project house (in the back of the workbook) shows that _____

a. the loss in the camera module is –5 dB
b. the desired off-air signal level at the antenna is +11/+1 dBmV
c. the required output level of the camera modulators is +28/+18 dBmV.
d. the required output level of the entertainment center modulators is +30/+25 dBmV

49. In the course project house, the distribution amplifier module that was used had a gain from the external signal input to the external cable outputs of _____

a. +4 dB
b. –1 dB
c. –10 dB
d. +4 dB to –16 dB

50. If all the desired FM stations at the project house had signal levels of at least 500 microvolts, a _____ antenna could have been used instead of the yagi.

a. bow-tie array
b. omni-directional
c. log-periodic
d. bi-directional