MOCK BOARD EXAMINATION IN ELECTRONIC SYSTEMS AND TECHNOLOGIES

June 9, 2009

1. Spacing bias distortion results in _____.
   a) Space being lengthened and marks being shortened
   b) Space being shortened and marks being lengthened
   c) Space being lengthened but marks being unaffected
   d) Extra spaces being printed on the teletypewriter

2. How much acoustic power must a public address system be able to put out in order to create an SPL of 100 dB for a musical show in the 10,000 cubic meter auditorium?
   a) 30 mW
   b) 200 W
   c) 33 W
   d) 80 W

3. What is the IF range of a satellite TV receiver?
   a) 950 to 1450 MHz
   b) 3.7 to 4.2 GHz
   c) 13.7 to 14.2 GHz
   d) 40 to 42 MHz

4. _____ is the range of quietness to loudness.
   a) Static Range
   b) Dynamic Range
   c) Flat Response
   d) Active Response

5. An AC transmission path has the characteristics of _____.
   a) A Low-Pass Filter
   b) A High-Pass Filter
   c) A band-pass Filter
   d) Both (a) and (b)

6. Any unwanted form of energy tending to interfere with the proper and easy reception of wanted signals
   a) Noise
   b) Sound Wave
   c) Electrical Energy
   d) Radio Wave

7. In a Yagi antenna _____.
   a) The director is shorter than the driven element
   b) The elements are spaced at least one wavelength apart
   c) The reflectors are shorter than the driven element
   d) There are usually more reflector than directors

8. The main purpose of modulation is to_____.
   a) Combine two waves of different frequencies
   b) Achieve wave-shaping of the carrier wave
   c) All of these
   d) Transmit low frequency information over long distances efficiently

9. The data transmission rate of a modem is measured in ____.
   a) Bytes Per Second
   b) Baud Rate
   c) Bits Per Second
   d) Megahertz

10. Demodulation
    a) Is performed at the transmitting station
    b) Removes Sidebands
    c) Rectifies Modulated Signal
    d) Is Opposite of Modulation

11. The standard ASCII _____.
    a) Is version II of the ASC standard
    b) Has 128 characters including 32 control characters
    c) Is a subset of the 8-bit EBCDIC code
    d) Is used only in the US and Canada

12. In amplitude modulation _____.
    a) Carrier Frequency is Changed
    b) Carrier Amplitude is Changed
    c) Three Sidebands are Produced
    d) Fidelity is Improved

13. Which is not an example of data communications?
    a) A teletype printing news bulletins
    b) A computer transmitting files to another computer
    c) An automatic teller machine checking account balances with the bank's computer
    d) A salesman telephoning orders to the office

14. _____ is a noise created outside the receiver.
    a) Internal Noise
    b) External Noise
    c) Shot Noise
    d) Industrial Noise

15. The corrections and accuracy of the transmitted message content is _____.
    a) Verified by the Modem
    b) Determined by the sender and receiver, not by the communications system
    c) Ensured by the use of digital techniques
    d) Both (a) and (c)

16. How many dB can a moderately vigorous speaking voice of Luciano Pavarrotti, produce acoustic power of 0.100 microwatts with a room volume of 100 cubic meters, with reverberation time of 1.2 seconds?
    a) 75dB
    b) 60dB
    c) 25dB
    d) 100dB

17. Two-state (binary) communications system are better because:
- **a)** They can interface directly with the analog telephone networks
- **b)** People think better in binary
- **c)** The components are simpler, less costly and more reliable
- **d)** Interstate calls are less costly

18. One hundred percent modulation is produced in AM when carrier
- **a)** Frequency equals Signal Frequency
- **b)** Frequency exceeds Signal Frequency
- **c)** Amplitude equals Signal Amplitude
- **d)** Amplitude exceeds Signal Amplitude

19. The difference between timing and framing is _____.
- **a)** Timing is concerned with the individual bits, framing is concerned with the boundaries between characters
- **b)** Timing is concerned primarily with asynchronous systems, framing is concerned of synchronous system
- **c)** Timing refers to serial transmission, framing refers to parallel
- **d)** Both (b) and (c)

20. _____ is a noise created by man.
- **a)** Solar Noise
- **b)** Industrial Noise
- **c)** Extraterrestial Noise
- **d)** Galactic Noise

21. Which of the following statements about flat unpaired cable is not correct? Flat cable
- **a)** Is effective in cramped locations where round cable will not easily fit
- **b)** Has poor immunity to noise induced by sources outside the cable
- **c)** None of these
- **d)** Has good adjacent pair noise immunity

22. For a given carrier wave, maximum undistorted power is transmitted when value of modulation is _____.
- **a)** 1
- **b)** 0.8
- **c)** 0.5
- **d)** 0

23. Asynchronous transmission _____.
- **a)** Is less efficient than synchronous, but simpler
- **b)** Is much faster than synchronous transmission
- **c)** Are used in asynchronous and synchronous systems, respectively
- **d)** Both (b) and (c)

24. In an AM wave with 100% modulation, each sideband carries ___ of the total transmitted power.
- **a)** One-half
- **b)** One-sixth
- **c)** One-third
- **d)** Two-thirds

25. What is the relationship between possible bandwidth and signal frequency?
- **a)** As bandwidth decreases, signal frequency decreases
- **b)** As signal frequency increases, bandwidth increases
- **c)** As signal frequency increases, bandwidth decreases
- **d)** They are not related

26. An average human conversation has an average Sound Pressure Level (SPL) of ____ dB.
- **a)** 0
- **b)** 40
- **c)** 100
- **d)** 60

27. The amount of uncertainty in a system of symbols is also called _____.
- **a)** Bandwidth
- **b)** Loss
- **c)** Enthalpy
- **d)** Entropy

28. Given a carrier frequency of 100 KHz and a modulating frequency of 5 KHz, the bandwidth of AM transmission is ___ KHz.
- **a)** 5
- **b)** 200
- **c)** 10
- **d)** 20

29. One of the following transmission impairments is not a problem with a microwave transmission. Which one?
- **a)** Multipath Fading
- **b)** Ducted Signals
- **c)** Rain Attenuations
- **d)** All of the preceding

30. When the transmitting and receiving antennas are in line of sight of each other, the mode of propagation is _____ wave.
- **a)** Sky
- **b)** Space
- **c)** Surface
- **d)** Ground

31. Redundancy measures _____.
- **a)** Transmission Rate of a System
- **b)** How likely Symbols are to be Repeated
- **c)** Time Between Failures
- **d)** System Caused Failures

32. In ionospheric propagation, the nearest distance at

which waves return to earth is referred to as ___ distance:
a) LOS
b) Ground Wave
c) Skip
d) Fresnel

33. What type of cable would you choose if you wanted an inexpensive, long-distance, medium-bandwidth transmission link where several circuits run in parallel?
a) Open Wire
b) Quadded-Exchange Cable
c) Quadded-toll Cable
d) Coaxial Cable

34. The region in the ionosphere mainly responsible for long distance night time communications is the _____.
a) D-layer
b) E-layer
c) F layer
d) A-layer

35. An example of bounded medium is _____.
a) Coaxial Cable
b) Waveguide
c) Fiber Optic Cable
d) All of the Preceding

36. Antenna polarization is determined by____.
a) The direction of the magnetic field vector
b) The direction of the electric field vector
c) The frequency of the radiated wave
d) The direction of the radiated wave

37. One of the following is not an advantage of coaxial cable for data communications. Which is it?
a) Wide Bandwidth
b) Flexibility of the System Layout
c) Noise Immunity
d) Right-of-way Costs

38. In a half-wave dipole antenna, maximum radiation occurs:
a) Off the Ends
b) Broadside to the Antenna
c) At 45^{o} angle to the direction of the dipole
d) When end effects are reduced to zero

39. Coaxial cable has conductors with _____.
a) The same Diameter
b) Common Axis
c) Equal Resistance
d) Both (a) and (c)

40. At even Fresnel zone radius, the microwave system has a ___.
a) Gain
b) Loss
c) No Gain and No Loss
d) Infinite FSL

41. Which of the following is not a characteristics of satellite transmission systems?
a) Long signal delays from sender to receiver
b) Affected by weather in the earth's surface
c) Vulnerable to the right galactic noise levels of space
d) Penetrates ionospheric layers

42. Fade margin is based from _____ threshold.
a) Noise
b) FM Improvement
c) Absolute
d) Detection

43. Fiber optic cables operate at frequencies near _____.
a) 20 MHz
b) 200 MHz
c) 2 GHz
d) 800 Thz

44. A method of diversity reception applied to reflective path to reduce fading is _____ diversity.
a) Frequency
b) Space
c) Polarization
d) Angle

45. The frequency range of piano is from 25 to 8,000 Hertz. What is the range of wavelengths in feet?
a) 45.2 to 0.14125 ft
b) 142.3 to 163.8 ft
c) 0.14125 to 45.2 ft
d) 300 to 3,000 ft

46. The amount of attenuation present in a waveguide is due to _____.
a) The air dielectric filling the guide
b) The fine coating of silver inside
c) I^2R Losses
d) Losses in the conducting walls of the guide

47. HF radio waves have how many basic paths leaving the transmitter?
a) Two
b) Four
c) One
d) Many

48. A material wrapped around the parabolic antenna aperture to eliminate sidelobes interfering nearby microwave stations is called _____.
a) Radome
b) Shield
c) Shroud
d) Dust Cover

49. If sound waves are converted to electrical waves by a microphone. What is the frequency of the electric current?
- **a)** 3 to 30 MHz
- **b)** 25 to 8,000 Hz
- **c)** 4 to 40 Hz
- **d)** 30 to 3,000 Hz

50. In a telephone transmitter, conversion of acoustic energy into electric energy is accomplished by means of a varying resistance of the carbon granules. When carbon granules are compressed, the resistance is
- **a)** Decreased
- **b)** Increased
- **c)** The Same
- **d)** None of these

51. The requirements for successful transmission system using light are
- **a)** Powerful, Reliable Light Source
- **b)** Strong Glass
- **c)** Reliable, high cost transmission medium
- **d)** Power Amplifiers

52. A loading coil which is a common method to increase subscriber loop length will
- **a)** Reduce Loss
- **b)** Increase Impedance
- **c)** Decrease Velocity of Propagation
- **d)** All of the preceding

53. For a music lover concert "A" is 440 Hz. If a musical note one octave higher were played, it would be _____ that frequency.
- **a)** One-half
- **b)** One-fourth
- **c)** Double
- **d)** Triple

54. A loaded telephone cable using AWG # 22, with a spacing between loading coils between loading coils 6,000 feet and having an inductance of 88 mH, is specified as _____.
- **a)** 88 -22B
- **b)** 22-88B
- **c)** H-22-88
- **d)** 22-H-88

55. Multiple repeaters in communications satellites are known as
- **a)** Transponders
- **b)** Detectors
- **c)** Modulators
- **d)** Stations

56. In a two-party system, the method of ringing is called _____ frequency.
- **a)** Divided
- **b)** Multi
- **c)** Decimonic
- **d)** Harmonic

57. In a 220 Hz synthesizer signal, if a note were played one octave below it would be _____.
- **a)** 22 Hz
- **b)** 27.5 Hz
- **c)** 440 Hz
- **d)** 110 Hz

58. A switching equipment which connects a party to an idle circuit while speech is taking place and disconnects of 800 the party when speech is stopped is called _____.
- **a)** PCM
- **b)** ESS
- **c)** TASI
- **d)** FDM

59. The loss in signal power as light travels down a fiber is called:
- **a)** Propagation
- **b)** Scattering
- **c)** Absorption
- **d)** Attenuation

60. A line from the telephone subscriber to the Central Office is called _____.
- **a)** Inter-office Trunk
- **b)** Tie
- **c)** Service Drop Wire
- **d)** Subscriber Loop

61. The earth's area or region that the satellite can receive from or transmit to
- **a)** Footprint
- **b)** Primary Area
- **c)** Skip Zone
- **d)** Coverage Area

62. If the grade of service of a telephone system is indicated as P = 0.005, it means
- **a)** Completed Calls of 5%
- **b)** Lost Calls of 5%
- **c)** Lost Calls of 95%
- **d)** Lost Calls of 105%

63. When the index of refraction is greater in material 1 than it is in material 2, the velocity of propagation in material 1 compared to material 2 is _____.
- **a)** Equal to or Greater
- **b)** Greater
- **c)** Lesser
- **d)** Equal

64. During the busy hour in a telephone system, an average of one call out of 100 is lost. The grade of service is approximately:
- **a)** 1.01 %
- **b)** 10%

c) 0.10
d) 0.01

65. Incidentally proposed the geostationary scheme or orbit of the satellite in 1940's.
a) Arthur Clarke
b) Carl F Gauss
c) Samuel Morse
d) Stephen Gray

66. A transmission line with a characteristic impedance (Z_0) of 300 Ohms is terminated in a resistive load (RL) If by measurement, the minimum and maximum voltages through the load are 12 and 20 microvolts certain respectively, what is the SWR?
a) 1.67
b) 0.6
c) 6.7
d) 0.3

67. Deposition of dopants on fiber preforms is done by _____.
a) Outside Vapor Deposition
b) Axial Vapor Deposition
c) Inside Vapor Deposition
d) All of the Preceding

68. A transmission line with a characteristic impedance (Z_0) of 300 ohms is terminated in a resistive load (R_L) If by measurement, the minimum and maximum voltages through the load are 12 and 20 microvolts, respectively, what are the two possible values of load R_L in Ohms?
a) 300 and 600 Ohms
b) 600 and 900 Ohms
c) 150 and 80 Ohms
d) 501 and 180 Ohms

69. When the satellites are spaced 4^o of the 360^o complete circle, how many orbital slots are available.
a) 90
b) 85
c) 95
d) 80

70. A line has characteristic impedance of 1000 /-30^o Ohms and is terminated to a load having an impedance of 800 – jl00 Ohms. The line's SWR and return loss are _____ and ____ respectively.
a) 6.1; 17.62
b) 1.26; 12.76
c) 2.6; 17.26
d) 3.6, 12.76

71. The core of an optical fiber has_____
a) A lower index of refraction than air
b) A lower index of refraction than the cladding
c) A higher index of refraction than the cladding
d) Both (a) and (b)

72. In ionospheric propagation, the highest frequency that will be reflected back to earth, if propagated at a certain angle of incidence is called ____.
a) Critical Frequency
b) MUF
c) LUF
d) Cut-off Frequency

73. Analogous to power dissipation in copper cables _____.
a) Absorption Loss
b) Scattering Losses
c) Modal Dispersion
d) Radiation Losses

74. Remote users to a LAN can be restricted by _____ Modems
a) Callback
b) Dial-up
c) Asynchronous
d) Synchronous

75. ___ are the different angles of entry into an optical fiber when the diameter of the core is many times the wavelength of the light transmitted.
a) Emitters
b) Modes
c) Sensors
d) Refraction

76. AWG 19 copper wire has a diameter of 35.89 mils. The cross-sectional area is ____ circular mils.
a) 35.89
b) 19
c) 1144
d) 1288

77. It is usually made from a semiconductor material such as aluminum-gallium-arsenide or gallium-arsenide. phosphide _____.
a) Light Emitting Diode
b) Injection Laser Diode
c) Positive Intrinsic Diode
d) APD

78. An AWG 10 wire having a diameter of 0.102 inch has an area of ___ circular mils.
a) 4110
b) 6400
c) 10,400
d) 14,600

79. In single mode fibers, a large fraction of the power is cultivated in the _____.
a. a. Sheath
b. b. Core
c. c. Cladding
d. d. Armor

80. An AM broadcasting station is rated at 5 kilowatts. If

the received signals vary as the square root of the radiated power, then how much gain (in dB) would be apparent to a nearby listener if the broadcasting station doubled its power?
a) 3
b) 1.5
c) 6
d) 2.5

81. A process in which the trapped photons in the active region stimulate free electrons to recombine with holes at a higher than normal energy level as they reflect back and forth.
a) Lasing
b) Emission
c) Photoelectric Effect
d) Detecting

82. The length of a half-wave dipole for 28 MHz is approximately____.
a) 17.6 feet
b) 23.6 feet
c) 30.6 feet
d) 34.6 feet

83. When amplitude modulation is varied to represent information, the method is called _____.
a) PCM
b) PWM
c) PAM
d) PPM

84. One kilowatt is supplied to a rhombic antenna resulting to 20 microvolts per meter at the receiving station. In order to produce the same field strength at the receiving station, a half-wave antenna, properly oriented and located near the rhombic, must be supplied with 16.6 kilowatts. What is the gain (in dB) of the rhombic referred to isotropic antenna?
a) 12.2
b) 6.5
c) 14.35
d) 10.25

85. The amount of voltage induced in a wire by an electromagnetic wave is determined by the wave's
a) Field Strength
b) Direction of Travel
c) Velocity
d) Frequency

86. The effective area of an isotropic antenna operating on 136 Megahertz is equal to _____ square meters.
a) 2.22
b) 0.39
c) 1.64
d) 2.15

87. Demultiplexing by a TDM occurs based upon _____.
a) The position of data within a frame
b) The position of a frame within a group of frames
c) The activity of a connected device
d) The priority assigned to a connected device

88. The effective absorbing area of a half-wave dipole antenna operating on 136 MHz is _____ square meters.
a) 2.03
b) 0.64
c) 1.64
d) 2.15

89. An antenna supported by insulators appears electrically longer than its physical length due to_____.
a) End Effect
b) Reflection
c) The Ionosphere
d) The Troposphere

90. If the base station antenna is 100 feet high and the mobile antenna is 6 feet high, the expected unobstructed distance between the 2 stations is about _____ miles.
a) 13
b) 27
c) 17
d) 47

91. Two state (binary) communications systems are better because
a) They can interface directly with the analog telephone network
b) Interstate cells are less costly
c) The components are simpler, less costly and more reliable
d) People think better in binary

92. A circuit where transmission is possible in both directions at the same time but not between the same two stations.
a) Half-Duplex
b) Full-Duplex
c) Full/Half duplex
d) Full/Full Duplex

93. In a half-wave dipole, maximum radiation of electromagnetic energy occurs _____.
a) Broadside to the Antenna
b) Off the ends
c) At 45^{o} angle to the direction of the dipole
d) When the end effects are reduced to zero

94. A code that uses three unequal lengths, marks dot, dash and space to encode a character.
a) Baudot Code
b) Morse Code
c) ASCII

d) Hollerith

95. Codes are always _____.
- **a)** Eight bits per Character
- **b)** Either 7 or 8 bits per Character
- **c)** The same in all medium computers
- **d)** Agreed upon in advance between the sender and the Receiver

96. Which among these codes is 5-bit character code?
- **a)** EBCDIC
- **b)** ASCII
- **c)** Baudot
- **d)** Trellis

97. An electromagnetic wave consists of _____
- **a)** Both Electric and Magnetic Fields
- **b)** A Magnetic Field only
- **c)** An Electric Field only
- **d)** Non-Magnetic Field only

98. In data communications, ARQ means _____.
- **a)** Automatic Requisition
- **b)** Automatic Request for Retransmission
- **c)** Automatic Request Code
- **d)** Automatic Request Repeat

99. The principal difference between batch processing and on-line processing is _____.
- **a)** Telephones are used for batch processing, CRTs are used for on-line processing
- **b)** Transactions are grouped for batch processing; transactions are processed as needed for on-line processing
- **c)** On-line processing are exclusively used only for ATM banking while batch processing is universal
- **d)** Computer resources are used more effectively for on-line processing

100. _____ insures that the transmitter and receiver agree on a precise time slot for the occurrence of a bit.
- **a)** Carrier Synchronization
- **b)** Message Synchronization
- **c)** Character Synchronization
- **d)** Clock Synchronization

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COMMUNICATIONS ENGINEERING PRE BOARD EXAMINATION
ANSWERS

1	A	21	D	41	A	61	A	81	A
2	C	22	A	42	B	62	B	82	A
3	A	23	A	43	D	63	C	83	C
4	B	24	B	44	B	64	D	84	C
5	C	25	B	45	A	65	A	85	A
6	A	26	D	46	D	66	A	86	B
7	A	27	D	47	A	67	D	87	A
8	D	28	C	48	C	68	D	88	B
9	B	29	C	49	B	69	A	89	A
10	D	30	B	50	A	70	B	90	C
11	B	31	B	51	A	71	C	91	C
12	B	32	C	52	D	72	B	92	D
13	D	33	C	53	C	73	A	93	A
14	B	34	C	54	D	74	A	94	B
15	B	35	D	55	A	75	B	95	D
16	A	36	B	56	A	76	D	96	C
17	C	37	D	57	D	77	A	97	A
18	C	38	B	58	C	78	C	98	B
19	A	39	B	59	D	79	C	99	B
20	B	40	B	60	D	80	B	100	D

SOLUTIONS:

2. SPL = 10 Log [Ptr / V] + 134 dB = 100=10 Log[(1.2P) / $(10)^5$] + 134
$(10)^{-3.4}$ = P (1.2×10^{-5}) or P = 33 watts

16. SPL=l0 Log [Ptr / V] + 134 = l0 Log [(1.2×10^{-4}) / $(10)^2$] + 134 = 75dB

28. BW = 2_{fm} = 2(5) = 10 KHz

56. Note : Divided ringing is also known as Ground Return Ringing.

58. NOTE: TASI - stands for Time Assignment Speech Interpolation

64. GOS = 1 / 100 = 0.01

66. SWR = 20/12 = 1.667

68. $R_L = (Z_0) / (SWR) = 300 / 1.67 = 180$ Ohms; $.R_L = (Z_0)$ (SWR) = (300) (1.67) = 501 Ohms

70. Convert Z^0 from polar to rectangular form
$Z_0 = 100 \angle -30^o$ =866.03 - j500 and Z_L = 800- jl00

$$\rho = \frac{Z_L - Z_o}{Z_L + Z_o} = \frac{(800 - j100) - (866.03 - j500)}{(800 + j100) + (866.03 - j500)} = \frac{-66.03 - j400}{1666.03 - j600}$$

$$/\rho/^2 = \frac{(66.03)^2 + (400)^2}{(1666.03)^2 + (600)^2} = \frac{164{,}359.96}{3{,}135{,}655.96} = 0.0524$$; Extracting the square root: /ρ/ = 0.23

$$SWR = \frac{1 + /\rho/}{} = \frac{1 + 0.23}{} = 1.259 = 1.26$$

1 - /ρ/ 1 – 0.23

RETURN LOSS = 20 Log [(1) / (/ρ/)] = 20 Log (1 / 0.23) = 12.76 dB

76. $A_{CM} = (d)^2 = (35.89)^2 = 1288_{CM}$

Note: A circular mil is the cross-sectional area of a wire with a diameter of 1 mil (1 inch = 1000 mils). The following formulas are used for computations:

$A_{CM} = (D)^2$ and $A_{SM} = (\pi/4)(A_{CM})$

78. $A_{CM} - [(0.102)(1000)]^2 = 10{,}404_{CM}$

80. Gain = 10 Log $\sqrt{10 \text{ km} / 5 \text{ km}}$ = 10 log $\sqrt{2}$ = 1.505 Db

82. $\lambda/2 = (1/2)$ [3 X 10^8 m/sec) / (28 X 10^6 Hertz)] = 10.71 / 2 = 5.355 meters x 3.29 ft/meter = 17.618

84. Gain = Antenna Gain + Gain of dipole antenna over isotropic = 10 Log (16.6/1) + 2.15
Gain = 12.2 dB + 2.15 dB = 14.35 dBi

86. $A_{eff} = (\lambda)^2 / 4\pi = \{[(3 \times 10^8) / (136 \times 10^6)]\}^2 / [(4)(3.1416)]$ = 0.39 square meter

88. $A_{eff} = [(1.64)(\lambda)^2] / (4\pi) = (1.64)(0.39) = 0.64$ square meter

90. $d = \sqrt{2 H_1} + \sqrt{2H_2} = \sqrt{(2)(100)} + \sqrt{(2)(6)}$ = 17.606 miles