



ENTRANCE EXAMINATION – JULY 2016

QUESTION PAPER

PROGRAMME : Ph. D

ELECTRONICS AND COMMUNICATION ENGINEERING

Time : 2 hours

Marks: 100

INSTRUCTION TO THE CANDIDATES

1. Use only Pencil to indicate your answers. Use Ball-Point only for writing Name, Register Number and Signature.
2. Darken the square completely. Mark your answers like this

1	2	3	4
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3. Part A is common to all.

Name of the Student: Programme Applied:	Register Number <table border="1" style="margin: 0 auto; width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Exam Centre Seal										
Signature of the Student	Signature of the Invigilator										

NIUEE 2016

Part A

1. The development of a solid foundation of reliable knowledge typically is built from which type of research?
 - a. basic research
 - b. action research
 - c. evaluation research
 - d. orientational research
2. The idea that when selecting between two different theories with equal explanatory value, one should select the theory that is the most simple, concise, and succinct is known as _____.
 - a. criterion of falsifiability
 - b. critical theory
 - c. guide of simplicity
 - d. rule of parsimony
3. Research that is done to examine the findings of someone else using the "same variables but different people" is which of the following?
 - a. exploration
 - b. Hypothesis
 - c. Replication
 - d. empiricism
4. A researcher designs an experiment to test how variables interact to influence how well children learn spelling words. In this case, the main purpose of the study was:
 - a. Explanation
 - b. Description
 - c. Influence
 - d. Prediction
5. What is the key defining characteristic of experimental research?
 - a. extraneous variables are never present
 - b. a positive correlation usually exists
 - c. a negative correlation usually exists
 - d. manipulation of the independent variable
6. Which of the following includes examples of quantitative variables?
 - a. age, temperature, income, height
 - b. grade point average, anxiety level, reading performance
 - c. gender, religion, ethnic group
 - d. both a and b
7. One step that is not included in planning a research study is:
 - a. Identifying a researchable problem
 - b. A review of current research
 - c. Statement of the research question
 - d. Developing a research plan
8. Sources of researchable problems can include:
 - a. Researchers' own experiences as educators
 - b. Practical issues that require solutions
 - c. Theory and past research
 - d. All of the above
9. The feasibility of a research study should be considered in light of:
 - a. Cost and time required to conduct the study
 - b. Skills required of the researcher
 - c. Potential ethical concerns
 - d. All of the above
10. A formal statement of the research question or "purpose of research study" generally _____.
 - a. Is made prior to the literature review
 - b. Is made after the literature review
 - c. Will help guide the research process
 - d. b and c

11. Which term refers to publishing several articles from the data collected in one large study?
 - a. Duplicate publication
 - b. Partial publication
 - c. Triplicate publication
 - d. None of these
12. Which of the following is a right of each participant according to the AERA?
 - a. Deception
 - b. Utilitarianism
 - c. Freedom to withdraw
 - d. Participants have no rights
13. Which of the following is a type of criterion-related validity evidence?
 - a. Concurrent evidence
 - b. Predictive evidence
 - c. Internal consistency
 - d. Both a and b are correct answers
14. Which of the following is not a type of reliability?
 - a. Test-retest
 - b. Split-half
 - c. Content
 - d. Internal consistency
15. Which of the following types of reliability refers to the consistency of test scores over time?
 - a. Equivalent forms reliability
 - b. Split-half reliability
 - c. Test-retest reliability
 - d. Inter-scorer reliability
16. Which type of reliability refers to the consistency of a group of individuals' scores on two equivalent forms of a test designed to measure the same characteristic?
 - a. Split-half
 - b. Test-retest
 - c. Split-forms
 - d. Equivalent forms
17. _____ refers to how well the particular sample of behaviors used to measure a characteristic reflects the entire domain of behaviors that constitutes that characteristic.
 - a. Construct validity evidence
 - b. Criterion-related validity evidence
 - c. Content validity evidence
 - d. Face validity evidence
18. Which of these is not a method of data collection.
 - a. Questionnaires
 - b. Interviews
 - c. Experiments
 - d. Observations
19. Another name for a Likert Scale is a(n):
 - a. Interview protocol
 - b. Event sampling
 - c. Summated rating scale
 - d. Ranking
20. A question during an interview such as "Why do you feel that way?" is known as a:
 - a. Probe
 - b. Filter question
 - c. Response
 - d. Pilot
21. A census taker often collects data through which of the following?
 - a. Standardized tests
 - b. Interviews
 - c. Secondary data
 - d. Observations
22. In which of the following nonrandom sampling techniques does the researcher ask the research participants to identify other potential research participants?
 - a. Snowball
 - b. Convenience
 - c. Purposive
 - d. Quota
23. Which of the following is the most efficient random sampling technique?
 - a. Simple random sampling
 - b. Proportional stratified sampling
 - c. Cluster random sampling
 - d. Systematic sampling

24. Which of the following would usually require the smallest sample size because of its efficiency?
- One stage cluster sampling
 - Simple random sampling
 - Two stage cluster sampling
 - Quota sampling
25. _____ is a set of elements taken from a larger population according to certain rules.
- Sample
 - Population
 - Statistic
 - Element

Part B

26. Which of the following configurations has the lowest output impedance?
- Fixed-bias
 - Voltage-divider
 - Emitter-follower
 - None of the above
27. An RC phase shift oscillator will not produce any oscillation until and unless the voltage gain of its internal amplifier is
- unity
 - less than unity
 - around 3
 - more than 29
28. The current gain for the Darlington connection is _____.
- $\beta_1 \cdot (\beta_2 / 2)$
 - $\beta_1 \cdot \beta_2$
 - β_1 / β_2
 - $\beta_1 \cdot (\beta_2 - 1)$
29. At what phase shift is the magnitude of βA at its maximum in the Nyquist plot?
- 90°
 - 180°
 - 270°
 - 0°
30. Which of the following improvements is (are) a result of the negative feedback in a circuit?
- lower output impedance
 - reduced noise
 - more linear operation
 - all of the above
31. The main features of a large-signal amplifier is the circuit's _____.
- power efficiency
 - maximum power limitations
 - impedance matching to the output device
 - All of the above
32. The principal advantage(s) of BJTs over MOSFETs is (are) that
- voltage drop across the transistor is important
 - they are not as prone to ESD
 - both of the above
 - none of the above
33. Each diode in a center-tapped full-wave rectifier is _____ -biased and conducts for _____ of the input cycle.
- forward, 90°
 - reverse, 180°
 - forward, 180°
 - reverse, 90°
34. Determine the total discharge time for the capacitor in a clamper having $C = 0.01 \mu\text{F}$ and $R = 500 \text{ k}\Omega$.
- 5 ms
 - 25 ms
 - 2.5 ms
 - 50 ms
35. The major function of transistor Q2 is
- It provides voltage gain
 - It provides the feedback signal
 - It isolates the oscillator from loading effect
 - It provides a phase shift
36. Three different Q points are shown on a dc load line. The upper Q point represents the
- minimum current gain
 - intermediate current gain
 - maximum current gain
 - cutoff point

37. Which of the following methods can't be used to increase the bandwidth for cascaded RF amplifier stages?
- Wave traps in each stage
 - Stagger Tuning
 - A shunt damping resistor across each tuned circuit
 - Double tuned transformers with tighter coupling
38. A high Q quartz crystal exhibits series resonance at the frequency ω_s and parallel resonance at ω_p . Then
- ω_s is very close to but less than ω_p
 - $\omega_s \ll \omega_p$
 - $\omega_s \gg \omega_p$
 - ω_s is very close, but greater than ω_p
39. In class A direct coupled (series fed) power amplifier, maximum dissipation capacity of the transistor is 2.5Watt. When delivering maximum ac power, dc power in the load is
- 1.25Watts
 - 2.5Watts
 - 5.6 Watts
 - 0.65 Watts
40. If a two stage amplifier is required to have an upper cutoff frequency of 2MHz and a lower cutoff frequency of 30MHz then upper & lower cutoff frequencies of individual stage are respectively.
- 4MHz, 60Hz
 - 3MHz, 20Hz
 - 3MHz, 60Hz
 - 4MHz, 20Hz
41. Which one of the following statement is true of phase shift type & wien bridge type RC oscillator?
- Both uses positive feedback
 - Former uses positive feedback only whereas later uses both positive & negative feedback.
 - Former uses both positive & negative feedback whereas the later uses positive feedback end
 - Both uses negative feedback
42. Current limited power supplies can prevent damage to
- Rectifier diodes & power transformers
 - Pass transistors
 - Other circuits in the system
 - All of the above
43. The ADC0804 is an example of a _____.
- single-slope analog-to-digital converter
 - dual-slope analog-to-digital converter
 - digital-ramp analog-to-digital converter
 - successive-approximation analog-to-digital converter
44. In a digital representation of voltages using an 8-bit binary code, how many values can be defined?
- 16
 - 64
 - 128
 - 256
45. A binary-weighted-input digital-to-analog converter has an input resistor of 100 k Ω . If the resistor is connected to a 5 V source, current through the resistor is _____.
- 50 Ma
 - 50 μ A
 - 5 mA
 - 500 μ A
46. What is the result of taking more samples during the quantization process?
- More errors in the analog-to-digital conversion
 - More bit requirements
 - More accurate signal representation

- d. More bit requirements and more accurate signal representation
47. Which is a typical application of digital signal processing?
 a. Noise elimination b. Music signal processing
 c. Image processing d. All of the above
48. How are unwanted frequencies removed prior to digital conversion?
 a. Pre-filters b. Digital signal processing
 c. Sample-and-hold circuits d. All of the above
49. Which type of programming is typically used for digital signal processors?
 a. Assembly language b. Machine language
 c. C d. None of the above
50. Which of the following best defines Nyquist frequency?
 a. The frequency of resonance for the filtering circuit
 b. The second harmonic
 c. The lower frequency limit of sampling
 d. The highest frequency component of a given analog signal
51. In a flash analog-to-digital converter, the output of each comparator is connected to an input of a _____.
 a. Decoder b. Priority encoder c. Multiplexer d. Demultiplexer
52. Which term applies to the maintaining of a given signal level until the next sampling?
 a. Holding b. Aliasing
 c. Shannon frequency sampling d. Stair-stepping
53. The dual-slope analog-to-digital converter finds extensive use in _____.
 a. digital voltmeters b. function generators
 c. frequency counters d. all of the above
54. The resolution of a DAC can be expressed as the _____.
 a. minimum output voltage
 b. number of bits that are converted to an analog output
 c. deviation of the output from a straight line
 d. difference between the expected and actual outputs
55. Assume that in a certain 4-bit weighted ladder DAC, the input representing the most significant bit is applied to a 20 k Ω resistor. What is the size of the resistor that represents the least significant bit?
 a. 2.5 k Ω b. 5 k Ω c. 80 k Ω d. 160 k Ω
56. An ADC that uses an up/down counter (and other devices) to follow changes in the input analog signal is a _____.
 a. single-slope ramp converter b. dual-slope ramp converter
 c. successive-approximation converter d. tracking converter
57. Bilinear transform equation between S-plane and Z-plane
 a. $s = \frac{T}{2} \left[\frac{1 - Z^{-1}}{1 + Z^{-1}} \right]$ b. $s = \frac{2}{T} \left[\frac{1 + Z^{-1}}{1 - Z^{-1}} \right]$

$$c. \quad s = \frac{2[1 - Z^{-1}]}{T[1 + Z^{-1}]}$$

$$d. \quad s = \frac{T[1 + Z^{-1}]}{2[1 - Z^{-1}]}$$

58. The necessary and sufficient condition for linear phase in FIR filter is

$$a. \quad h(n) = h(N + 1 - n)$$

$$b. \quad h(n) = h(N - 1 - n)$$

$$c. \quad h(n) = -h(N - 1 - n)$$

$$d. \quad h(n) = -h(N + 1 - n)$$

59. Relationship between digital and analog frequency in Bilinear transformation is

$$a. \quad \omega = \frac{1}{2} \tan^{-1} \frac{\Omega T}{2}$$

$$b. \quad \omega = 2 \tan^{-1} \frac{2}{\Omega T}$$

$$c. \quad \omega = \frac{1}{2} \tan^{-1} \frac{2}{\Omega T}$$

$$d. \quad \omega = 2 \tan^{-1} \frac{\Omega T}{2}$$

60. The digital filter transfer function of analog filter $H(s) = 1 / (s+1)$ is

$$a. \quad \frac{1}{1 + e^{-T}Z^{-1}}$$

$$b. \quad \frac{1}{1 + e^T Z^{-1}}$$

$$c. \quad \frac{1}{1 - e^T Z^{-1}}$$

$$d. \quad \frac{1}{1 - e^{-T}Z^{-1}}$$

61. The filter coefficient $H = -0.673$ is represented by sign-magnitude fixed point arithmetic. If the word length is 6-bits, then the quantization error due to truncation is

$$a. \quad 1.001125$$

$$b. \quad -0.001125$$

$$c. \quad 0.001125$$

$$d. \quad -1.001125$$

62. Consider the following statements S1 and S2

S1: Poles of Butterworth filter lie on an ellipse

S2: Poles of Chebyshev filter lie on an ellipse

a. S1 is False & S2 is True

b. both S1 & S2 are True

c. S1 is True & S2 is False

d. both S1 & S2 are False

63. Chip utilization depends on ____.

a. Only on standard cells

b. Standard cells and macros

c. Only on macros

d. Standard cells, macros and IO pads

64. Cross talk can be avoided by ____.

a. Decreasing the spacing between the metal layers

b. Shielding the nets

c. Using lower metal layers

d. Using long nets

65. Which of the following metal layer has Maximum resistance?

a. Metal1

b. Metal2

c. Metal3

d. Metal4

66. Leakage power is inversely proportional to ____.

a. Frequency

b. Load Capacitance

c. Supply voltage

d. Threshold Voltage

67. Filler cells are added ____.

a. Before Placement of std cells

b. After Placement of Std Cells

c. Before Floor planning

d. Before Detail Routing

68. Search and Repair is used for ____.

a. Reducing IR Drop

b. Reducing DRC

c. Reducing EM violations

d. None

69. More IR drop is due to ____.

a. Increase in metal width

b. Increase in metal length

c. Decrease in metal length

d. Lot of metal layers

70. CRPR stands for ____.
- a. Cell Convergence Pessimism Removal
 - b. Cell Convergence Preset Removal
 - c. Clock Convergence Pessimism Removal
 - d. Clock Convergence Preset Removal
71. In OCV timing check, for setup time, ____.
- a. Max delay is used for launch path and Min delay for capture path
 - b. Min delay is used for launch path and Max delay for capture path
 - c. Both Max delay is used for launch and Capture path
 - d. Both Min delay is used for both Capture and Launch paths
72. To avoid cross talk, the shielded net is usually connected to ____.
- a. VDD
 - b. VSS
 - c. Both VDD and VSS
 - d. Clock
73. Hold violations are preferred to fix ____.
- a. Before placement
 - b. After placement
 - c. Before CTS
 - d. After CTS
74. Timing sanity check means (with respect to PD) ____.
- a. Checking timing of routed design without net delays
 - b. Checking Timing of placed design with net delays
 - c. Checking Timing of unplaced design without net delays
 - d. Checking Timing of routed design with net delays
75. Which of the following is having highest priority at final stage (post routed) of the design ____?
- a. Setup violation
 - b. Hold violation
 - c. Skew
 - d. None
76. Which of the following is preferred while placing macros ____?
- a. Macros placed center of the die
 - b. Macros placed left and right side of die
 - c. Macros placed bottom and top sides of die
 - d. Macros placed based on connectivity of the I/O
77. Routing congestion can be avoided by ____.
- a. placing cells closer
 - b. Placing cells at corners
 - c. Distributing cells
 - d. None
78. In Physical Design following step is not there ____.
- a. Floorplaning
 - b. Placement
 - c. Design Synthesis
 - d. CTS
79. In technology file if 7 metals are there then which metals you will use for power?
- a. Metal1 and metal2
 - b. Metal3 and metal4
 - c. Metal5 and metal6
 - d. Metal6 and metal7
80. Which configuration is more preferred during floor planning?
- a. Double back with flipped rows
 - b. Double back with non flipped rows
 - c. With channel spacing between rows and no double back
 - d. With channel spacing between rows and double back
81. Delay of a cell depends on which factors ?

- a. Output transition and input load b. Input transition and Output load
c. Input transition and Output transition d. Input load and Output Load.

82. Utilisation of the chip after placement optimisation will be ____.
a. Constant b. Decrease c. Increase d. None of the above
83. The phase velocity of an electromagnetic wave propagating in a hollow metallic rectangular waveguide in the TE_{10} mode is
a. equal to its group velocity
b. less than the velocity of light in free space
c. equal to the velocity of light in free space
d. greater than the velocity of light in free space
84. Consider a lossless antenna with a directive gain of +6 dB. If 1 mW of power is fed to it the total power radiated by the antenna will be
a. 4 mW b. 1 mW c. 7 mW d. 1/4 mW
85. Two sinusoidal signals of same amplitude and frequencies 10 kHz and 10.1 kHz are added together. The combined signal is given to an ideal frequency detector. The output of the detector is
a. 0.1 kHz sinusoid b. 20.1 kHz sinusoid
c. a linear function of time d. a constant
86. Choose the current one from among the alternative A, B, C, D after matching an item from Group 1 with the most appropriate item in Group 2.

Group 1

1. FM
2. DM
3. PSK
4. PCM

Group 2

- P. Slope overload
Q. μ -law
R. Envelope detector
S. Hilbert transform
T. Hilbert transform
U. Matched filter

- a. 1 - T, 2 - P, 3 - U, 4 - S b. 1 - S, 2 - U, 3 - P, 4 - T
c. 1 - S, 2 - P, 3 - U, 4 - Q d. 1 - U, 2 - R, 3 - S, 4 - Q

87. A plane electromagnetic wave propagating in free space is incident normally on a large slab of loss-less, non-magnetic, dielectric material with $\epsilon > \epsilon_0$. Maxima and minima are observed when the electric field is measured in front of the slab. The maximum electric field is found to be 5 times the minimum field. The intrinsic impedance of the medium should be
a. $120\pi \Omega$ b. $60\pi \Omega$ c. $600\pi \Omega$ d. $24\pi \Omega$
88. For a Hertz dipole antenna, the half power beam width (HPBW) in the E -plane is
a. 360° b. 180° c. 90° d. 45°
89. A uniform plane wave in the free space is normally incident on an infinitely thick dielectric slab (dielectric constant $\epsilon = 9$). The magnitude of the reflection coefficient is
a. 0 b. 0.3 c. 0.5 d. 0.8
90. At 20 GHz, the gain of a parabolic dish antenna of 1 meter and 70% efficiency is
a. 15 dB b. 25 dB c. 35 dB d. 45 dB

91. Four messages band limited to W , W , $2W$ and $3W$ respectively are to be multiplexed using Time Division Multiplexing (TDM). The minimum bandwidth required for transmission of this TDM signal is
 a. W b. $3W$ c. $6W$ d. $7W$
92. A communication channel with AWGN operating at a signal to noise ratio $SNR \gg 1$ and bandwidth B has capacity C_1 . If the SNR is doubled keeping constant, the resulting capacity C_2 is given by
 a. $C_2 = 2C_1$ b. $C_2 = C_1 + B$ c. $C_2 = C_1 + 2B$ d. $C_2 = C_1 + 0.3B$
93. A transmission line has a characteristic impedance of 50Ω and a resistance of $0.1 \Omega/m$. If the line is distortion less, the attenuation constant (in Np/m) is
 a. 500 b. 5 c. 0.014 d. 0.002
94. A carrier is phase modulated (PM) with frequency deviation of 10 kHz by a single tone frequency of 1 kHz. If the single tone frequency is increased to 2 kHz, assuming that phase deviation remains unchanged, the bandwidth of the PM signal is
 a. 21 kHz b. 22 kHz c. 42 kHz d. 44 kHz
95. Characteristic impedance of a transmission line is 50Ω . Input impedance of the open-circuited line when the transmission line is short circuited, then value of the input impedance will be.
 a. 50Ω b. $100 + j150\Omega$ c. $7.69 + j11.54\Omega$ d. $7.69 - j11.54\Omega$
96. Which wave cannot exist inside wave guide
 a. TE b. TM c. TEM d. HE
97. Considering the following statement: In a magic tee
 1. The collinear arms are isolated from each other
 2. One of the collinear is isolated from the E-arm
 3. One of the collinear arm is isolated from the H-arm
 4. E-arm and H-arm are isolated from each other. Of these statements
 a. 1 and 2 are correct b. 1 and 3 are correct
 c. 1 and 4 are correct d. 2 and 3 are correct.
98. When a dipole antenna of $1/8$ length has an equivalent total resistance of 1.5 Watt then the efficiency of the antenna is
 a. 0.89159% b. 8.9159% c. 89.159% d. 891.59%
99. In commercial FM broadcasting, the maximum frequency deviation is normally
 a. 5 KHz b. 15 KHz c. 75 KHz d. 200 KHz
100. A splice is a
 a. A non permanent connection of two fibres
 b. A non separable junction of two fibres
 c. A process of cutting the fibre at the ends
 d. None of these