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PD - 23

Total No. of Pages : 14

Ph.d Entrance Examination March - April, 2026
Electronics and Telecommunication Engineering
Subject Code: 58836

Day and Date : Wednesday, 07-10-2026

Total Marks : 100

Time :10.00 a.m. to 12.00 p.m.

Instructions :

- 1) All questions are compulsory.
 - 2) Each question carries 2 marks.
 - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
 - 4) Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR answer sheet.
 - 5) Follow the instructions given on OMR Sheet.
 - 6) Rough work shall be done on the sheet provided at the end of question paper.
 - 7) Only non-programmable calculators are allowed.
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Section 1- Research Methodology

1. Which type of research is most suitable for validating a newly proposed signal processing algorithm for noise reduction in telecommunication systems?

A) Fundamental research.

B) Applied research

C) Action research

D) Descriptive research
2. The purpose of a literature review in doctoral research is primarily to:

A) Summarize all existing papers in the field

B) Demonstrate the researcher's understanding ability

C) Identify knowledge gaps and position the new research

D) Replace the need for experiments done by previous researchers

3. Which of the following would not qualify as plagiarism?
 - A) Copy pasting text without citation
 - B) Using an idea with proper attribution
 - C) Submitting someone else's project under one's own name
 - D) Paraphrasing without acknowledgment
4. Which of the following best distinguishes research ethics from research methodology?
 - A) Ethics deals with values and principles, methodology with techniques and processes
 - B) Ethics is optional, methodology is mandatory
 - C) Methodology concerns plagiarism and ethics concerns data analysis
 - D) Research methodology is at higher priority than research ethics
5. Which of the following is an example of an ethical violation in research publishing?
 - A) Using APA format instead of IEEE format
 - B) Submitting the same manuscript to two journals simultaneously
 - C) Using too many references
 - D) Writing an extended abstract
6. A good research design should be characterized by:
 - A) Flexibility, efficiency and lack of precision
 - B) Objectivity, reliability and validity
 - C) Vagueness, subjectivity and unbiased
 - D) Exclusively qualitative data collection

7. Sampling design refers to:
 - A) A fixed method of collecting samples
 - B) The framework for selecting a subset from a population
 - C) The physical design of research equipment
 - D) Random selection of samples for research
8. Stratified random sampling is most suitable when:
 - A) Population is homogeneous and no need to divide further
 - B) Population is heterogeneous and can be divided into subgroups
 - C) Convenience of the researcher is seen in sampling
 - D) Samples in population are dissimilar
9. Which of the following is not a criterion for selecting a sampling procedure?
 - A) Nature of the population
 - B) Accuracy required
 - C) Size of the population
 - D) Preferences set by the researchers
10. The principle of replication in experimental design ensures:
 - A) Minimization of error variance
 - B) Research on the respective topic is finished
 - C) Comparison of two unrelated variables is done
 - D) The research is completed faster

11. A measurement is said to be valid if:
- A) It produces consistent results under repeated trials
 - B) It measures exactly what it is intended to measure
 - C) It uses numerical data only
 - D) It can be applied to any population without modification
12. Which method of data collection is most prone to interviewer's bias?
- A) Mailed questionnaire
 - B) Observation
 - C) Personal interview
 - D) Use of published secondary data
13. Which statistical measure would you most appropriately use to understand the degree and direction of linear relationship between two continuous variables?
- A) Variance
 - B) Correlation coefficient
 - C) Standard deviation
 - D) Median
14. The main distinction between a questionnaire and a schedule is that:
- A) A schedule is self administered while a questionnaire requires an interviewer
 - B) A questionnaire is filled by respondents, while a schedule is filled by the enumerator
 - C) Both are identical except in name
 - D) A questionnaire always uses open ended questions, while a schedule always uses closed ended

15. The coding stage in data processing refers to:
- A) Assigning numerical or symbolic values to responses
 - B) Entering data into tables
 - C) Removing outliers from the dataset
 - D) Designing the questionnaire
16. The null hypothesis (H_0) usually states that:
- A) There is no significant difference or relationship
 - B) The researcher's assumption is always correct
 - C) Variables are dependent
 - D) Experimentation have gone fail and hypothesis is wrong
17. In hypothesis testing, the probability of rejecting a true null hypothesis is called:
- A) Type I error
 - B) Type II error
 - C) Power of the test
 - D) Level of confidence
18. A hypothesis which states that there is a relationship between two variables is called:
- A) Null hypothesis
 - B) Alternative hypothesis
 - C) Zero hypothesis
 - D) Random hypothesis
19. Which of the following is a parametric test?
- A) Chi square test
 - B) T test
 - C) Kruskal Wallis test
 - D) Mann Whitney U test

20. The chi square test is most commonly used for:
- A) Comparing sample means
 - B) Testing independence of categorical variables.
 - C) Testing regression coefficients
 - D) Estimating population parameters
21. Which section of a research paper is most likely to contain both limitations of the study and future research directions?
- A) Introduction
 - B) Methodology
 - C) Discussion/Conclusion
 - D) Abstract
22. A well structured abstract typically should not include:
- A) The research objectives.
 - B) A brief summary of methodology
 - C) Extensive details of literature review
 - D) Key findings
23. In multivariate analysis, while reporting results, the researcher should emphasize:
- A) Relationships among the highest correlated variables
 - B) Relationships among multiple variables simultaneously
 - C) Only descriptive statistics such as mean and median
 - D) How independent variables are reported individually
24. In research report writing, the mechanics primarily refer to:
- A) The depth of data interpretation
 - B) The grammatical, formatting, and referencing style
 - C) The structure of statistical tests used
 - D) The originality of the research findings

25. In accordance with the IEEE Editorial Guidelines, which of the following is the most correct and precise way to include acknowledgments in a research article?
- A) Acknowledgment should appear after the abstract, mentioning all contributors, including family and friends, with informal expressions of gratitude.
 - B) Acknowledgment is an optional section placed before the references, written in formal third person, typically used to recognize financial support, institutional help, and technical assistance, but not personal relationships.
 - C) Acknowledgment must be placed after the references, including complete bibliographic details with photographs of authors and supporting agencies in IEEE reference format.
 - D) Acknowledgment should be integrated on first page of article as a foot note. The names of contributors, their support and other details must be written.

Section 2- Subject specific

26. $V_{in15} = V$, $V_z = 6V$ series resistor $R_s = 300 \text{ ohm}$. If the load draws $I_L = 10mA$ the Zener diode current I_z (approx) is:
A) 10 mA
B) 20 mA
C) 30 mA
D) 40 mA
27. A CE amplifier has $R_c = 2k\Omega$, unbypassed $R_e = 225\Omega$, and transistor transconductance $g_m = 40 \text{ mS}$. Using $A_v \approx -R_c/(R_e + 1/g_m)$, the midband small-signal voltage gain A_v is approx:
A) -5.0
B) -8.0
C) -17.8
D) -40.0
28. The Miller effect in an inverting amplifier with a feedback capacitance C_f , causes the effective input capacitance to appear approximately as:
A) $C_{fb} + C_{in}$
B) $C_{fb} * (1 + A_v)$ for $A_v > 0$
C) $C_{fb} * (1 - A_v)$ (A_v negative)
D) Zero (it cancels)
29. The Barkhausen criterion for sustained oscillations requires:
A) Loop gain $|A\beta| > 1$ and total phase shift = 180°
B) $|A\beta| = 1$ and total phase shift = 0° (or 360°)
C) $|A\beta| < 1$ and phase shift = 0°
D) $|A\beta| = 0$
30. An inverting amplifier is designed with $R_f = 100 K\Omega$ and $R_{in} = 10 K\Omega$. If the input voltage is $V_{in} = 0.2V$. What is the output voltage?
A) -1 V
B) -2 V
C) -10 V
D) -20 V

31. A zener diode regulator is designed with input = 15 V, zener voltage = 9 V, series resistance 330 Ω , and load resistance = 1 k Ω . What is the load voltage?
A) 8.9 V
B) 9. V
C) 9.1 V
D) 10 V
32. In an ideal op-amp, the input impedance is:
A) Zero
B) Infinite
C) Very small
D) Equal to output impedance
33. The main purpose of an instrumentation amplifier is:
A) To amplify common-mode signals
B) To amplify weak differential signals with high CMRR
C) To amplify weak signals by rejecting noise at high CMRR
D) To act as a frequency oscillator
34. A single-loop circuit has a resistor of 8 Ω , an inductor of 0.5 H, and a voltage source of 20 V DC. Find the steady-state current after a long time.
A) 1.25 A
B) 2.5 A
C) 5 A
D) 10 A
35. A sinusoidal voltage source of 10 $\angle 0^\circ$ V is applied to a series circuit of R = 3 Ω and X_c = j 4 Ω The current magnitude is:
A) 1.25 A
B) 2 A
C) 2.5 A
D) 3.2 A

41. In an 8085 microprocessor, the RST 7.5 interrupt is:

- A) Non-maskable and level triggered
- B) Maskable and edge triggered
- C) Non-maskable and edge triggered
- D) Maskable and level triggered

42. A unity feedback system has:

$$G(s) = \frac{K}{s(s+3)}$$

Find the value of gain K at the stability limit using the Routh-Hurwitz criterion.

- | | |
|------|------|
| A) 0 | B) 3 |
| C) 6 | D) 9 |

43. A unity feedback system has open-loop transfer function:

$$G(s) = \frac{50}{s(s+5)}$$

Determine the steady-state error for a unit step input.

- | | |
|---------|-------------|
| A) 0 | B) 0.02 |
| C) 0.05 | D) ∞ |

44. A second-order system has characteristic equation:

$$s^2 + 2\zeta\omega_n s + \omega_n^2 = 0$$

If the settling time (2% criterion) is 2 sec and damping ratio is 0.5, find the natural frequency ω_n .

- | | |
|--------------|------------|
| A) 2.5 rad/s | B) 3 rad/s |
| C) 3.5 rad/s | D) 4 rad/s |

45. In state-space representation, which one is true?
- A) State equations are always unique for a system
 - B) State equations describe system behaviour only in frequency domain
 - C) Different state models can represent the same system
 - D) State models cannot be used for time-domain analysis
46. The Poynting vector in electromagnetic theory physically represents:
- A) The instantaneous velocity of EM waves..
 - B) The energy density of the electromagnetic field.
 - C) The rate of energy transfer per unit area.
 - D) The reactive power associated with standing waves.
47. A plane wave is normally incident from free space $\eta_1 = 377 \, \Omega$ onto a dielectric medium with intrinsic impedance $\eta_2 = 100 \, \Omega$. The reflection coefficient at the boundary is:
- A)-0.58
 - B) 0.58
 - C)-0.72
 - D) 0.72
48. In a wireless communication channel, the thermal noise at the receiver is modeled as a random variable with Gaussian distribution. What does this imply?
- A) The noise has a uniform probability across all amplitude values
 - B) The noise amplitude follows a bell-shaped probability density function
 - C) The noise is always constant with fixed amplitude
 - D) The noise power is independent of bandwidth

49. The probability of bit error in a Binary Phase Shift Keying (BPSK) system under Additive White Gaussian Noise (AWGN) channel depends on:
- A) Gaussian random variable of noise
 - B) Poisson random variable of arrivals
 - C) Uniform random variable of signal strength
 - D) Exponential random variable of fading
50. In a Rician fading channel, the K-factor represents:
- A) Square value of the ratio of signal power to noise power in line of sight (LOS) path
 - B) Ratio of power in the direct line of sight (LOS) path to the power in the scattered paths
 - C) Ratio of Doppler shift to maximum frequency
 - D) Ratio of multipath delay spread to symbol duration



- Rough Work -