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PH.D.-EE-October, 2026 (Electronics and Comm. Engg. (UIET))

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Sr. No. .....

Time : 1¼ Hours **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name _____ Father's Name _____

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1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet / OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answers (1), (2), (3), (4) are given. The candidate is to choose only one answer which he / she considers the correct or best one. If the candidate darkens more than one circle or cutting / over writing / erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question book-let.
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7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection / complaint, if any, with regard to discrepancy in the question booklet / answer key within 24 hours of uploading the same on the University website. The complaint be sent by the student to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
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SEAL

1. Research carried out to find a solution to an immediate practical problem faced by an industry or society is termed as :

(1) Historical research

(2) Fundamental (pure) research

(3) Applied research

(4) Exploratory research

2. Which of the following is the first step in the research process ?

(1) Identifying and defining the research problem

(2) Writing the final research report

(3) Drawing inferences and generalisations

(4) Collecting primary data

3. A study that applies signal-processing techniques to diagnose cardiac disorders from ECG records combines concepts from engineering and medicine. Such research is best described as :

(1) Historical research

(2) Philosophical research

(3) Longitudinal research

(4) Interdisciplinary research

4. Which sequence correctly represents the hypothetico-deductive scientific method ?

(1) Conclusion → experimentation → observation → hypothesis → deduction

(2) Experimentation → hypothesis → observation → deduction → conclusion

(3) Hypothesis → conclusion → observation → experimentation → deduction

(4) Observation → formulation of hypothesis → deduction of testable consequences → testing/experimentation → acceptance or rejection of hypothesis

5. According to Karl Popper, the criterion that distinguishes a scientific hypothesis from a non-scientific one is its :

(1) Verifiability through the opinion of recognised authorities

(2) Use of complex mathematical formulation

(3) Falsifiability, i.e., it can in principle be refuted by observation or experiment

(4) Acceptance by a majority of scientists

6. In a study of the effect of temperature on the resistance of a metallic wire, the resistance is the :

(1) Independent variable

(2) Dependent variable

(3) Moderating variable

(4) Extraneous variable

7. Which of the following is the LEAST appropriate criterion for selecting a research topic ?

(1) Choosing it because it is certain to confirm the researcher's existing beliefs

(2) Availability of literature, data and other resources

(3) Its originality and potential contribution to the field

(4) Feasibility within the available time frame

8. The primary purpose of a literature review at the start of a research project is :

(1) To identify gaps in existing knowledge and avoid duplication of earlier work

(2) To obtain raw data for the final statistical analysis

(3) To increase the number of pages in the thesis

(4) To select the sample for the study

9. Publishing the results of a single study in several fragmentary papers merely to inflate the publication count is known as :

(1) Ghost authorship

(2) Salami slicing

(3) Gift authorship

(4) Data fabrication

10. Manipulating research materials or processes, or changing or omitting data so that the research record is not accurately represented, is called :

(1) Falsification

(2) Fabrication

(3) Self-citation

(4) Plagiarism

11. The primary function of an Institutional Ethics Committee (Institutional Review Board) is :

(1) To decide the order of authors in publications

(2) To fund approved research projects

(3) To check manuscripts for textual similarity before publication

(4) To protect the rights, safety and well-being of human participants by reviewing research proposals

12. According to the ICMJE criteria, which of the following alone does *not* qualify a person for authorship ?

(1) Drafting the work or revising it critically for important intellectual content

(2) Substantial contribution to the conception, design or data analysis of the work

(3) Final approval of the version to be published and agreeing to be accountable for the work

(4) Securing funding or providing general supervision of the research group

13. The question 'Do you think the college library is well stocked and its staff courteous ?' is an example of a/an :

(1) Double-barrelled question

(2) Leading question

(3) Open-ended question

(4) Loaded question

14. Which statement correctly distinguishes a schedule from a questionnaire ?

(1) In a schedule the questions are asked and filled in by an enumerator, whereas in a questionnaire the respondent fills in the answers

(2) A schedule contains only open-ended questions, whereas a questionnaire contains only closed-ended questions

(3) A schedule is mailed to respondents, whereas a questionnaire is administered by an enumerator

(4) A schedule is used only for collecting secondary data

15. The main purpose of a pilot study (pre-test) is to :

(1) Replace the main survey when the population is large

(2) Obtain the final results of the research

(3) Test and refine the research instrument and procedure on a small sample before the main study

(4) Avoid the need for ethical clearance

16. An unstructured interview is characterised by :

(1) Absence of an interviewer

(2) Exclusively closed-ended questions with coded options

(3) A fixed set of identical questions asked in a fixed order

(4) Flexible wording and order of questions that may evolve during the conversation

17. When the observer becomes a member of the group being studied and takes part in its activities, the technique is called :

(1) Non-participant observation

(2) Content analysis

(3) Structured questionnaire survey

(4) Participant observation

18. A Likert scale is :

(1) A summated rating scale in which respondents indicate their degree of agreement or disagreement with statements

(2) A technique to map social relationships among group members

(3) A bipolar-adjective scale known as the semantic differential

(4) A ratio scale used to measure physical length

19. Which of the following is an example of secondary data ?

(1) Responses obtained by the researcher through a self-administered survey

(2) Interview transcripts collected by the researcher

(3) Population figures taken from the published Census report

(4) Readings recorded by the researcher in his own laboratory experiment

20. In stratified random sampling the population is first :

(1) Arranged in a list and every k-th unit is selected from a random start

(2) Divided into homogeneous, non-overlapping subgroups, and a random sample is drawn from each

(3) Approached through referrals from the initial respondents

(4) Divided into heterogeneous clusters, and some clusters are selected entirely at random

21. Which of the following is a non-probability sampling technique ?

(1) Snowball sampling

(2) Stratified random sampling

(3) Simple random sampling

(4) Systematic random sampling

22. If the sample size is increased from 100 to 400 (population standard deviation unchanged), the standard error of the sample mean :

(1) remains unchanged

(2) is doubled

(3) is reduced to one-fourth

(4) is halved

23. Cronbach's alpha is commonly used to assess the :

(1) Normality of a data distribution

(2) Internal consistency reliability of a multi-item scale

(3) External validity of an experiment

(4) Sampling error of a survey

24. In an IMRaD-structured research paper, the details that allow other researchers to replicate the study are given in the :

(1) Acknowledgements

(2) Introduction

(3) Discussion

(4) Methods section

25. Which of the following is normally placed in the preliminary pages (front matter) of a thesis ?

(1) Bibliography

(2) Concluding chapter

(3) Appendices

(4) Table of contents

26. Which of the following is the most important pre-writing consideration in report writing ?

(1) Analysing the purpose of the report and the needs of its intended readers

(2) Choosing the binding style of the final copy

(3) Selecting the font colour

(4) Deciding the number of copies to be printed

27. The author-date in-text citation system, e.g., (Smith, 2020), is a characteristic of :

(1) Vancouver style

(2) APA style

(3) IEEE style

(4) Numbered footnote system

28. In footnote referencing, 'Ibid.' is used to refer to :

(1) An unpublished source with no known author

(2) A work cited earlier, but not in the immediately preceding footnote

(3) The full bibliography at the end of the thesis

(4) The work cited in the immediately preceding footnote

29. A bibliography differs from a reference list in that a bibliography :

(1) is placed only at the beginning of the thesis

(2) lists only the works cited in the text

(3) may include works consulted but not directly cited in the text

(4) contains only web-based sources

30. The Journal Impact Factor for year Y is computed as :

(1) Citations received by the journal's five most-cited papers ÷ five

(2) Total number of papers published in year Y ÷ total citations received in year Y

(3) Citations in year Y to items published in the previous two years ÷ number of citable items published in those two years

(4) Number of papers published by the journal ÷ number of its reviewers

31. A researcher's six papers have been cited 10, 8, 5, 4, 3 and 0 times. Her h-index is :

(1) 3 (2) 5

(3) 4 (4) 6

32. In a double-blind peer review process :

(1) The authors know the reviewers' identities but not vice versa

(2) Neither the authors nor the reviewers know each other's identities

(3) The editor alone judges the paper without any external reviewer

(4) The reviewers know the authors' identities but not vice versa

33. The mean of 10 observations is 20 and the mean of another 15 observations is 30. The combined mean of all 25 observations is :

(1) 26 (2) 25

(3) 22 (4) 28

34. A vehicle travels a certain distance at 60 km/h and returns over the same distance at 40 km/h. The average speed for the whole journey is :

(1) 48 km/h

(2) 50 km/h

(3) 52 km/h

(4) 45 km/h

35. For a moderately skewed distribution, the mean is 20 and the median is 18. Using the empirical relation, the mode is approximately :

(1) 18

(2) 16

(3) 12

(4) 14

36. The (population) standard deviation of the data 2, 4, 4, 4, 5, 5, 7, 9 is :

(1) 2.5

(2) 2

(3) 1.5

(4) 4

37. In simple linear regression, the correlation coefficient between X and Y is $r = -0.8$. The coefficient of determination is :

(1) 0.80

(2) – 0.64

(3) 0.64

(4) 0.89

38. A Type I error occurs when :

(1) A true null hypothesis is rejected

(2) A true null hypothesis is accepted

(3) A false null hypothesis is rejected

(4) A false null hypothesis is accepted

39. In hypothesis testing, a p-value of 0.03 means that :

(1) If the null hypothesis were true, data at least as extreme as that observed would occur with probability 0.03

(2) The effect size is 3% of the population mean

(3) The probability that the null hypothesis is true is 0.03

(4) There is a 97% probability that the result will be replicated

40. To test whether the means of three or more independent groups differ significantly, the appropriate parametric test is :

(1) Paired t-test

(2) Chi-square test

(3) Z-test for a single proportion

(4) One-way ANOVA (F-test)

41. The Chi-square test of independence is used to examine :

(1) The equality of means across several groups

(2) The association between two categorical variables

(3) The linear correlation between two interval-scale variables

(4) The difference between two population means

42. In a normal distribution, approximately what percentage of the observations lie within ± 2 standard deviations of the mean ?

(1) 50%

(2) 68%

(3) 95%

(4) 99.9%

43. In Microsoft Excel, the function that computes the sample standard deviation of a data range is :

(1) STDEV.P

(2) AVEDEV

(3) STDEV.S

(4) VAR.P

44. Which of the following tools is primarily used to check manuscripts and theses for textual similarity (possible plagiarism) ?

(1) SPSS

(2) LaTeX

(3) Zotero

(4) Turnitin

45. In a data set $Q_1 = 20$ and $Q_3 = 40$. Using Tukey's 1.5 × IQR rule, an observation is flagged as a high outlier if it exceeds :

(1) 50
(2) 70
(3) 60
(4) 80

46. The decimal equivalent of $(1011.101)_2$ is :

(1) 11.125
(2) 11.5
(3) 13.625
(4) 11.625

47. The hexadecimal equivalent of the decimal number 173 is :

(1) 9D
(2) AD
(3) BD
(4) AB

48. The hexadecimal equivalent of the octal number $(745)_8$ is :

(1) 2E5
(2) 1E5
(3) 1F5
(4) 1D5

49. The sum of the binary numbers $(110110)_2$ and $(101011)_2$ is :

(1) 1100001
(2) 1101001
(3) 1011001
(4) 1100011

50. The sum of the hexadecimal numbers $(3F)_{16}$ and $(2B)_{16}$ is :

(1) 6B
(2) 5A
(3) 6A
(4) 7A

51. A 12 V source in series with a 6 Ω resistor is connected across a 3 Ω resistor. A variable load resistor R_L is connected in parallel with the 3 Ω resistor. The maximum power that can be delivered to R_L is :

(1) 8 W
(2) 4 W
(3) 2 W
(4) 1 W

52. A series RLC circuit has R = 2 Ω, L = 1 mH and C = 10 μF. Its quality factor at resonance is :

(1) 2.5
(2) 5
(3) 10
(4) 20

53. The inverse Laplace transform of $F(s) = 1/1[s(s + 2)]$, $Re\{s\} > 0$, is :

(1) $\frac{1}{2}(1-e^{-2t})u(t)$

(2) $\frac{1}{2}e^{-2t}u(t)$

(3) $(1-e^{-2t})u(t)$

(4) $\frac{1}{2}(1+e^{-2t})u(t)$

54. A symmetrical T-network has each series arm equal to 2 Ω and the shunt arm equal to 4 Ω. The transmission (ABCD) parameter B of this two-port is :

(1) 2.5 Ω
(2) 5 Ω
(3) 8 Ω
(4) 10 Ω

55. The signal $x(t) = \cos(2000\pi t) \cdot \cos(4000\Omega t)$ is to be sampled. The minimum sampling rate that avoids aliasing is :

(1) 12 kHz

(2) 6 kHz

(3) 4 kHz

(4) 3 kHz

56. The 4-point DFT X[k] of $x[n] = \{1, 2, 3, 4\}$ has X[1] equal to :

(1) $-2 + j2$

(2) $2 + j2$

(3) $-2 - j2$

(4) 10

57. A discrete-time LTI system has $H(z) = 1/[(1 - 0.5z^{-1})(1 - 2z^{-1})]$. If the system is stable, its impulse response $h[n]$ is :

(1) Two-sided (neither causal nor anti-causal)

(2) Anti-causal (left-sided)

(3) Causal and right-sided

(4) Of finite duration

58. The group delay of the FIR system with impulse response $h[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$ is :

(1) 0 sample

(2) 1 sample at all frequencies

(3) 2 samples at all frequencies

(4) Frequency dependent

59. In silicon at 300 K, $n_i = 1.5 \times 10^{10}$ cm^{-3}. A sample is doped with donors $N_D = 1.5 \times 10^{16}$ cm^{-3} and no acceptors. The equilibrium hole concentration is approximately :

(1) 1.5×10^{10} cm^{-3}

(2) 1.5×10^{16} cm^{-3}

(3) 1.5×10^{6} cm^{-3}

(4) 1.5×10^{4} cm^{-3}

60. An illuminated *p-n* junction solar cell delivers power to the load when it operates in which quadrant of its I-V characteristic (current taken positive in the forward-diode direction) ?

(1) First quadrant

(2) Second quadrant

(3) Third quadrant

(4) Fourth quadrant

61. A silicon p-n junction at 300 K has $N_A = N_D = 10^{16}$ cm^{-3} and $n_i = 1.5 \times 10^{10}$ cm^{-3} ($kT/q = 26$ mV). The built-in potential is approximately :

(1) 0.84 V
(2) 0.70 V
(3) 0.58 V
(4) 0.46 V

62. An n-channel MOSFET has $\mu_n C_{ox} (W/L) = 2$ mA/V^2 and $V_T = 1$ V. Neglecting channel-length modulation, the drain current for $V_{GS} = 3$ V and $V_{DS} = 5$ V is :

(1) 4 mA
(2) 8 mA
(3) 2 mA
(4) 16 mA

63. For an n-channel MOSFET, the threshold voltage increases when :

(1) The source-body junction is forward biased
(2) The substrate doping concentration is decreased
(3) The gate-oxide thickness is reduced
(4) The substrate (body) doping concentration is increased

64. In a Zener shunt regulator, $V_{in} = 12$ V, series resistance $R_s = 300\ \Omega$, $V_Z = 6$ V and the load is $R_L = 600\ \Omega$. The current through the Zener diode is :

(1) 20 mA
(2) 15 mA
(3) 10 mA
(4) 5 mA

65. A sinusoidal input $v_i = 5 \sin \omega t$ V is applied through a large capacitor to a diode clamp. The ideal diode has its anode grounded and its cathode connected to the output node. In steady state the output swings between :

(1) – 10 V and 0 V

(2) 0 V and + 10 V

(3) 0 V and + 5 V

(4) – 5 V and + 5 V

66. In a fixed-bias circuit, V_{CC} = 12 V, R^B = 565 kΩ (from V_{CC} to the base), R_C = 2 kΩ, β = 100 and V_{BE} = 0.7 V. The collector-emitter voltage in the active region is :

(1) 6 V

(2) 10 V

(3) 4 V

(4) 8 V

67. A common-source amplifier has g_m = 2 mS, R_D = 5 kΩ and r_o = 50 kΩ, with no load. The small-signal voltage gain is approximately :

(1) – 10.0

(2) – 9.1

(3) – 7.5

(4) – 2.0

68. In a MOS current mirror with equal channel lengths, the reference transistor has W/L = 10 and the output transistor has W/L = 60. If I_{REF} = 50 μA and channel-length modulation is neglected, the output current is :

(1) 600 μA

(2) 300 μA

(3) 150 μA

(4) 50 μA

69. An ideal inverting summing amplifier has $R_f = 10\ k\Omega$ and two inputs : $V_1 = 1\ V$ through $5\ k\Omega$ and $V_2 = 2\ V$ through $10\ k\Omega$. The output voltage is :

(1) $-4\ V$ (2) $-6\ V$

(3) $+4\ V$ (4) $-2\ V$

70. An op-amp with saturation levels of $\pm 12\ V$ is used as an inverting Schmitt trigger. Its non-inverting input is connected to ground through $R_1 = 1\ k\Omega$ and to the output through $R_2 = 9\ k\Omega$. The width of the hysteresis window is :

(1) 1.2 V (2) 12 V

(3) 24 V (4) 2.4 V

71. A Wien-bridge oscillator uses two equal resistors $R = 10\ k\Omega$ and two equal capacitors $C = 15.9\ nF$ in its frequency-selective network. The frequency of oscillation is approximately :

(1) 1 kHz (2) 6.28 kHz

(3) 10 kHz (4) 159 Hz

72. The IEEE-754 single-precision representation (in hexadecimal) of the decimal number – 6.5 is :

(1) C0A00000 (2) C1A00000

(3) 40D00000 (4) C0D00000

73. The Boolean function $F(A, B, C, D) = \Sigma m(0, 2, 5, 7, 8, 10, 13, 15)$ reduces to :

(1) $B \oplus D$ (2) $B \odot D$

(3) $A \otimes C$ (4) $A \odot C$

74. The minimum number of transistors required to implement $Y = (AB + CD + E)'$ as a single static CMOS complex gate is :

(1) 14 (2) 12

(3) 10 (4) 8

75. A 64-Mbit DRAM is organised as 16M × 4 and uses row/column address multiplexing. The number of address pins required is :

(1) 24 (2) 16

(3) 12 (4) 8

76. In a synchronous design the clock-to-Q delay is 1 ns, the maximum combinational delay is 6 ns and the setup time is 1 ns. Ignoring clock skew, the maximum clock frequency is :

(1) 100 MHz

(2) 125 MHz

(3) 143 MHz

(4) 167 MHz

77. An ADC with an input range of 0 – 10 V must resolve changes of 5 mV or better. The minimum number of bits required is :

(1) 12

(2) 11

(3) 10

(4) 9

78. A 5-stage instruction pipeline has a stage delay of 1 ns. Assuming no hazards or stalls, the time needed to execute 100 instructions is :

(1) 100 ns

(2) 104 ns

(3) 105 ns

(4) 500 ns

79. A unity-feedback system has open-loop transfer function $G(s) = 25/[s(s + 6)]$. The percentage peak overshoot of its unit-step response is approximately :

(1) 25%

(2) 16.3%

(3) 9.5%

(4) 4.6%

80. A unity-feedback system has $G(s) = 10/[s(s + 2)]$. The steady-state error for a unit-ramp input is :

(1) 0.1

(2) 0.2

(3) 0.5

(4) 2

81. The characteristic equation of a feedback system is $s^3 + 4s^2 + 5s + K = 0$. The system is stable for :

(1) $0 < K < 4$

(2) $0 < K < 5$

(3) $0 < K < 20$

(4) $K > 20$

82. For a unity-feedback system with $G(s) = K/[s(s + 2)(s + 4)]$, the breakaway point of the root locus is approximately at $s =$

(1) – 3.15

(2) – 2.00

(3) – 0.85

(4) – 0.50

83. A unity-feedback system has $G(s) = 2/[s(s + 1)(s + 2)]$. Its gain margin is approximately :

(1) 3 dB

(2) 6 dB

(3) 9.5 dB

(4) 12 dB

84. A system is described by $\dot{x}_1 = x_2, \dot{x}_2 = -2x_1 - 3x_2 + u, y = x_1$. Its transfer function $Y(s)/U(s)$ is :

(1) $2/(s^2 + 3s + 1)$

(2) $1/(s^2 + 2s + 3)$

(3) $s/(s^2 + 3s + 2)$

(4) $1/(s^2 + 3s + 2)$

85. A 500 W carrier is amplitude modulated to a depth of 80% by a sinusoid. The power in each sideband is :

(1) 660 W

(2) 40 W

(3) 160 W

(4) 80 W

86. An FM signal is $s(t) = 10 \cos [2\pi \times 10^6 t + 5 \sin (2\pi \times 2 \times 10^3 t)]$. Using Carson's rule, its bandwidth is approximately :

(1) 4 kHz

(2) 12 kHz

(3) 20 kHz

(4) 24 kHz

87. A superheterodyne receiver with IF = 455 kHz and a high-side local oscillator is tuned to 1000 kHz. The image frequency is :

(1) 455 kHz

(2) 1455 kHz

(3) 1910 kHz

(4) 2365 kHz

88. White noise with two-sided power spectral density 10^{-9} W/Hz is passed through an ideal unity-gain low-pass filter that passes $|f| \leq 1$ MHz. The output noise power is :

(1) 1 μW (2) 1 mW

(3) 2 mW (4) 4 mW

89. A channel of bandwidth 4 kHz has a signal-to-noise ratio of 15 (linear). According to the Shannon-Hartley theorem, its capacity is :

(1) 16 kbps (2) 32 kbps

(3) 60 kbps (4) 8 kbps

90. A rectangular pulse of amplitude 2 V and duration 1 μs is received in white Gaussian noise of two-sided PSD $N_0/2$, with $N_0 = 2\times 10^{-6}$ W/Hz (1 Ω reference). The maximum output SNR of a matched filter is :

(1) 1 (2) 2

(3) 4 (4) 8

91. A baseband system transmits 4 Msymbols/s using raised-cosine pulses with roll-off factor 0.5. The minimum bandwidth required for ISI-free transmission is :

(1) 6 MHz (2) 4 MHz

(3) 3 MHz (4) 2 MHz

92. A Hamming code uses 4 parity bits. The parameters (n, k) of this code are :

(1) (31, 26)

(2) (15, 11)

(3) (11, 7)

(4) (7, 4)

93. At the interface between two lossless dielectrics of different permittivities carrying no free surface charge, which of the following is continuous across the boundary ?

(1) The normal component of D

(2) The tangential component of D

(3) The normal component of E

(4) The normal component of the polarisation vector P

94. The skin depth of copper at 1 MHz is about 66 μm. At 100 MHz its skin depth is approximately :

(1) 660 μm

(2) 66 μm

(3) 6.6 μm

(4) 0.66 μm

95. A uniform plane wave in air is normally incident on a semi-infinite lossless non-magnetic dielectric of relative permittivity 9. The fraction of the incident power that is reflected is :

(1) 75%

(2) 50%

(3) 25%

(4) 11%

96. A 50 Ω lossless line is to be matched to a 200 Ω resistive load using a quarter-wave transformer. The characteristic impedance of the transformer section must be :

(1) 100 Ω

(2) 150 Ω

(3) 125 Ω

(4) 75 Ω

97. A 50 Ω lossless transmission line is terminated by a 150 Ω resistive load. The return loss ($-20 \log |S_{11}|$) at the load is approximately :

(1) 6 dB

(2) 9.5 dB

(3) 3 dB

(4) 12 dB

98. An air-filled rectangular waveguide of cross-section 4 cm × 2 cm is excited at 6 GHz. The modes that can propagate are :

(1) TE_{10} and TE_{20}

(2) TE_{10}, TE_{20} and TE_{01}

(3) TE_{10} and TE_{01}

(4) Only TE_{10}

99. A step-index optical fibre has a core refractive index of 1.50 and a cladding index of 1.46. Its numerical aperture is approximately :

(1) 0.34

(2) 0.54

(3) 0.04

(4) 0.17

100. Two identical isotropic radiators are spaced $\lambda/2$ apart and fed with equal-amplitude currents that are 180° out of phase. The direction(s) of maximum radiation is/are :

(1) Perpendicular to the line joining the elements (broadside)

(2) At 45° to the line joining the elements

(3) At 60° to the line joining the elements

(4) Along the line joining the elements (end-fire)

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100014

Sr. No. .....

Time : 1¼ Hours **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet / OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answers (1), (2), (3), (4) are given. The candidate is to choose only one answer which he / she considers the correct or best one. If the candidate darkens more than one circle or cutting / over writing / erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection / complaint, if any, with regard to discrepancy in the question booklet / answer key within 24 hours of uploading the same on the University website. The complaint be sent by the student to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehavior will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

1. The primary function of an Institutional Ethics Committee (Institutional Review Board) is :

   (1) To decide the order of authors in publications

   (2) To fund approved research projects

   (3) To check manuscripts for textual similarity before publication

   (4) To protect the rights, safety and well-being of human participants by reviewing research proposals

2. According to the ICMJE criteria, which of the following alone does *not* qualify a person for authorship ?

   (1) Drafting the work or revising it critically for important intellectual content

   (2) Substantial contribution to the conception, design or data analysis of the work

   (3) Final approval of the version to be published and agreeing to be accountable for the work

   (4) Securing funding or providing general supervision of the research group

3. The question 'Do you think the college library is well stocked and its staff courteous ?' is an example of a/an :

   (1) Double-barrelled question

   (2) Leading question

   (3) Open-ended question

   (4) Loaded question

4. Which statement correctly distinguishes a schedule from a questionnaire ?

(1) In a schedule the questions are asked and filled in by an enumerator, whereas in a questionnaire the respondent fills in the answers

(2) A schedule contains only open-ended questions, whereas a questionnaire contains only closed-ended questions

(3) A schedule is mailed to respondents, whereas a questionnaire is administered by an enumerator

(4) A schedule is used only for collecting secondary data

5. The main purpose of a pilot study (pre-test) is to :

(1) Replace the main survey when the population is large

(2) Obtain the final results of the research

(3) Test and refine the research instrument and procedure on a small sample before the main study

(4) Avoid the need for ethical clearance

6. An unstructured interview is characterised by :

(1) Absence of an interviewer

(2) Exclusively closed-ended questions with coded options

(3) A fixed set of identical questions asked in a fixed order

(4) Flexible wording and order of questions that may evolve during the conversation

7. When the observer becomes a member of the group being studied and takes part in its activities, the technique is called :

(1) Non-participant observation

(2) Content analysis

(3) Structured questionnaire survey

(4) Participant observation

8. A Likert scale is :

(1) A summated rating scale in which respondents indicate their degree of agreement or disagreement with statements

(2) A technique to map social relationships among group members

(3) A bipolar-adjective scale known as the semantic differential

(4) A ratio scale used to measure physical length

9. Which of the following is an example of secondary data ?

(1) Responses obtained by the researcher through a self-administered survey

(2) Interview transcripts collected by the researcher

(3) Population figures taken from the published Census report

(4) Readings recorded by the researcher in his own laboratory experiment

10. In stratified random sampling the population is first :

(1) Arranged in a list and every k-th unit is selected from a random start

(2) Divided into homogeneous, non-overlapping subgroups, and a random sample is drawn from each

(3) Approached through referrals from the initial respondents

(4) Divided into heterogeneous clusters, and some clusters are selected entirely at random

11. Which of the following is a non-probability sampling technique ?

(1) Snowball sampling

(2) Stratified random sampling

(3) Simple random sampling

(4) Systematic random sampling

12. If the sample size is increased from 100 to 400 (population standard deviation unchanged), the standard error of the sample mean :

(1) remains unchanged

(2) is doubled

(3) is reduced to one-fourth

(4) is halved

13. Cronbach's alpha is commonly used to assess the :

(1) Normality of a data distribution

(2) Internal consistency reliability of a multi-item scale

(3) External validity of an experiment

(4) Sampling error of a survey

14. In an IMRaD-structured research paper, the details that allow other researchers to replicate the study are given in the :

(1) Acknowledgements

(2) Introduction

(3) Discussion

(4) Methods section

15. Which of the following is normally placed in the preliminary pages (front matter) of a thesis ?

(1) Bibliography

(2) Concluding chapter

(3) Appendices

(4) Table of contents

16. Which of the following is the most important pre-writing consideration in report writing ?

(1) Analysing the purpose of the report and the needs of its intended readers

(2) Choosing the binding style of the final copy

(3) Selecting the font colour

(4) Deciding the number of copies to be printed

17. The author-date in-text citation system, e.g., (Smith, 2020), is a characteristic of:

(1) Vancouver style

(2) APA style

(3) IEEE style

(4) Numbered footnote system

18. In footnote referencing, 'Ibid.' is used to refer to :

(1) An unpublished source with no known author

(2) A work cited earlier, but not in the immediately preceding footnote

(3) The full bibliography at the end of the thesis

(4) The work cited in the immediately preceding footnote

19. A bibliography differs from a reference list in that a bibliography :

(1) is placed only at the beginning of the thesis

(2) lists only the works cited in the text

(3) may include works consulted but not directly cited in the text

(4) contains only web-based sources

20. The Journal Impact Factor for year Y is computed as :

(1) Citations received by the journal's five most-cited papers ÷ five

(2) Total number of papers published in year Y ÷ total citations received in year Y

(3) Citations in year Y to items published in the previous two years ÷ number of citable items published in those two years

(4) Number of papers published by the journal ÷ number of its reviewers

21. A researcher's six papers have been cited 10, 8, 5, 4, 3 and 0 times. Her *h*-index is :

(1) 3
(2) 5
(3) 4
(4) 6

22. In a double-blind peer review process :

(1) The authors know the reviewers' identities but not vice versa
(2) Neither the authors nor the reviewers know each other's identities
(3) The editor alone judges the paper without any external reviewer
(4) The reviewers know the authors' identities but not vice versa

23. The mean of 10 observations is 20 and the mean of another 15 observations is 30. The combined mean of all 25 observations is :

(1) 26
(2) 25
(3) 22
(4) 28

24. A vehicle travels a certain distance at 60 km/h and returns over the same distance at 40 km/h. The average speed for the whole journey is :

(1) 48 km/h
(2) 50 km/h
(3) 52 km/h
(4) 45 km/h

25. For a moderately skewed distribution, the mean is 20 and the median is 18. Using the empirical relation, the mode is approximately :

(1) 18

(2) 16

(3) 12

(4) 14

26. The (population) standard deviation of the data 2, 4, 4, 4, 5, 5, 7, 9 is :

(1) 2.5

(2) 2

(3) 1.5

(4) 4

27. In simple linear regression, the correlation coefficient between X and Y is $r = -0.8$. The coefficient of determination is :

(1) 0.80

(2) – 0.64

(3) 0.64

(4) 0.89

28. A Type I error occurs when :

(1) A true null hypothesis is rejected

(2) A true null hypothesis is accepted

(3) A false null hypothesis is rejected

(4) A false null hypothesis is accepted

29. In hypothesis testing, a p-value of 0.03 means that :

(1) If the null hypothesis were true, data at least as extreme as that observed would occur with probability 0.03

(2) The effect size is 3% of the population mean

(3) The probability that the null hypothesis is true is 0.03

(4) There is a 97% probability that the result will be replicated

30. To test whether the means of three or more independent groups differ significantly, the appropriate parametric test is :

(1) Paired t-test

(2) Chi-square test

(3) Z-test for a single proportion

(4) One-way ANOVA (F-test)

31. The Chi-square test of independence is used to examine :

(1) The equality of means across several groups

(2) The association between two categorical variables

(3) The linear correlation between two interval-scale variables

(4) The difference between two population means

32. In a normal distribution, approximately what percentage of the observations lie within ± 2 standard deviations of the mean ?

(1) 50%

(2) 68%

(3) 95%

(4) 99.9%

33. In Microsoft Excel, the function that computes the sample standard deviation of a data range is :

(1) STDEV.P

(2) AVEDEV

(3) STDEV.S

(4) VAR.P

34. Which of the following tools is primarily used to check manuscripts and theses for textual similarity (possible plagiarism) ?

(1) SPSS

(2) LaTeX

(3) Zotero

(4) Turnitin

35. In a data set $Q_1 = 20$ and $Q_3 = 40$. Using Tukey's 1.5 × IQR rule, an observation is flagged as a high outlier if it exceeds :

(1) 50
(2) 70
(3) 60
(4) 80

36. The decimal equivalent of $(1011.101)_2$ is :

(1) 11.125
(2) 11.5
(3) 13.625
(4) 11.625

37. The hexadecimal equivalent of the decimal number 173 is :

(1) 9D
(2) AD
(3) BD
(4) AB

38. The hexadecimal equivalent of the octal number $(745)_8$ is :

(1) 2E5
(2) 1E5
(3) 1F5
(4) 1D5

39. The sum of the binary numbers $(110110)_2$ and $(101011)_2$ is :

(1) 1100001
(2) 1101001
(3) 1011001
(4) 1100011

40. The sum of the hexadecimal numbers $(3F)_{16}$ and $(2B)_{16}$ is :

(1) 6B
(2) 5A
(3) 6A
(4) 7A

41. Research carried out to find a solution to an immediate practical problem faced by an industry or society is termed as :

(1) Historical research

(2) Fundamental (pure) research

(3) Applied research

(4) Exploratory research

42. Which of the following is the first step in the research process ?

(1) Identifying and defining the research problem

(2) Writing the final research report

(3) Drawing inferences and generalisations

(4) Collecting primary data

43. A study that applies signal-processing techniques to diagnose cardiac disorders from ECG records combines concepts from engineering and medicine. Such research is best described as :

(1) Historical research

(2) Philosophical research

(3) Longitudinal research

(4) Interdisciplinary research

44. Which sequence correctly represents the hypothetico-deductive scientific method ?

(1) Conclusion → experimentation → observation → hypothesis → deduction

(2) Experimentation → hypothesis → observation → deduction → conclusion

(3) Hypothesis → conclusion → observation → experimentation → deduction

(4) Observation → formulation of hypothesis → deduction of testable consequences → testing/experimentation → acceptance or rejection of hypothesis

45. According to Karl Popper, the criterion that distinguishes a scientific hypothesis from a non-scientific one is its :

(1) Verifiability through the opinion of recognised authorities

(2) Use of complex mathematical formulation

(3) Falsifiability, i.e., it can in principle be refuted by observation or experiment

(4) Acceptance by a majority of scientists

46. In a study of the effect of temperature on the resistance of a metallic wire, the resistance is the :

(1) Independent variable

(2) Dependent variable

(3) Moderating variable

(4) Extraneous variable

47. Which of the following is the LEAST appropriate criterion for selecting a research topic ?

(1) Choosing it because it is certain to confirm the researcher's existing beliefs

(2) Availability of literature, data and other resources

(3) Its originality and potential contribution to the field

(4) Feasibility within the available time frame

48. The primary purpose of a literature review at the start of a research project is :

(1) To identify gaps in existing knowledge and avoid duplication of earlier work

(2) To obtain raw data for the final statistical analysis

(3) To increase the number of pages in the thesis

(4) To select the sample for the study

49. Publishing the results of a single study in several fragmentary papers merely to inflate the publication count is known as :

(1) Ghost authorship

(2) Salami slicing

(3) Gift authorship

(4) Data fabrication

50. Manipulating research materials or processes, or changing or omitting data so that the research record is not accurately represented, is called :

(1) Falsification

(2) Fabrication

(3) Self-citation

(4) Plagiarism

51. A silicon p-n junction at 300 K has $N_A = N_D = 10^{16}$ cm^{-3} and $n_i = 1.5 \times 10^{10}$ cm^{-3} ($kT/q = 26$ mV). The built-in potential is approximately :

(1) 0.84 V
(2) 0.70 V
(3) 0.58 V
(4) 0.46 V

52. An n-channel MOSFET has $\mu_n C_{ox} (W/L) = 2$ mA/V^2 and $V_T = 1$ V. Neglecting channel-length modulation, the drain current for $V_{GS} = 3$ V and $V_{DS} = 5$ V is :

(1) 4 mA
(2) 8 mA
(3) 2 mA
(4) 16 mA

53. For an n-channel MOSFET, the threshold voltage increases when :

(1) The source-body junction is forward biased
(2) The substrate doping concentration is decreased
(3) The gate-oxide thickness is reduced
(4) The substrate (body) doping concentration is increased

54. In a Zener shunt regulator, $V_{in} = 12$ V, series resistance $R_s = 300\ \Omega$, $V_Z = 6$ V and the load is $R_L = 600\ \Omega$. The current through the Zener diode is :

(1) 20 mA
(2) 15 mA
(3) 10 mA
(4) 5 mA

55. A sinusoidal input $v_i = 5 \sin \omega t$ V is applied through a large capacitor to a diode clamp. The ideal diode has its anode grounded and its cathode connected to the output node. In steady state the output swings between :

(1) -10 V and 0 V

(2) 0 V and $+10$ V

(3) 0 V and $+5$ V

(4) -5 V and $+5$ V

56. In a fixed-bias circuit, $V_{CC} = 12$ V, $R^B = 565$ kΩ (from V_{CC} to the base), $R_C = 2$ kΩ, $\beta = 100$ and $V_{BE} = 0.7$ V. The collector-emitter voltage in the active region is :

(1) 6 V

(2) 10 V

(3) 4 V

(4) 8 V

57. A common-source amplifier has $g_m = 2$ mS, $R_D = 5$ kΩ and $r_o = 50$ kΩ, with no load. The small-signal voltage gain is approximately :

(1) -10.0

(2) -9.1

(3) -7.5

(4) -2.0

58. In a MOS current mirror with equal channel lengths, the reference transistor has W/L = 10 and the output transistor has W/L = 60. If $I_{REF} = 50$ μA and channel-length modulation is neglected, the output current is :

(1) 600 μA

(2) 300 μA

(3) 150 μA

(4) 50 μA

59. An ideal inverting summing amplifier has R_f = 10 kΩ and two inputs : V_1 = 1 V through 5 kΩ and V_2 = 2 V through 10 kΩ. The output voltage is :

(1) −4 V
(2) −6 V
(3) +4 V
(4) −2 V

60. An op-amp with saturation levels of ± 12 V is used as an inverting Schmitt trigger. Its non-inverting input is connected to ground through R_1 = 1 kΩ and to the output through R_2 = 9 kΩ. The width of the hysteresis window is :

(1) 1.2 V
(2) 12 V
(3) 24 V
(4) 2.4 V

61. A Wien-bridge oscillator uses two equal resistors R = 10 kΩ and two equal capacitors C = 15.9 nF in its frequency-selective network. The frequency of oscillation is approximately :

(1) 1 kHz
(2) 6.28 kHz
(3) 10 kHz
(4) 159 Hz

62. The IEEE-754 single-precision representation (in hexadecimal) of the decimal number − 6.5 is :

(1) C0A00000
(2) C1A00000
(3) 40D00000
(4) C0D00000

63. The Boolean function $F(A, B, C, D) = \Sigma m(0, 2, 5, 7, 8, 10, 13, 15)$ reduces to :

(1) $B \oplus D$

(2) $B \odot D$

(3) $A \otimes C$

(4) $A \odot C$

64. The minimum number of transistors required to implement $Y = (AB + CD + E)'$ as a single static CMOS complex gate is :

(1) 14

(2) 12

(3) 10

(4) 8

65. A 64-Mbit DRAM is organised as 16M × 4 and uses row/column address multiplexing. The number of address pins required is :

(1) 24

(2) 16

(3) 12

(4) 8

66. In a synchronous design the clock-to-Q delay is 1 ns, the maximum combinational delay is 6 ns and the setup time is 1 ns. Ignoring clock skew, the maximum clock frequency is :

(1) 100 MHz

(2) 125 MHz

(3) 143 MHz

(4) 167 MHz

67. An ADC with an input range of 0 – 10 V must resolve changes of 5 mV or better. The minimum number of bits required is :

(1) 12

(2) 11

(3) 10

(4) 9

68. A 5-stage instruction pipeline has a stage delay of 1 ns. Assuming no hazards or stalls, the time needed to execute 100 instructions is :

(1) 100 ns

(2) 104 ns

(3) 105 ns

(4) 500 ns

69. A unity-feedback system has open-loop transfer function $G(s) = 25/[s(s + 6)]$. The percentage peak overshoot of its unit-step response is approximately :

(1) 25%

(2) 16.3%

(3) 9.5%

(4) 4.6%

70. A unity-feedback system has $G(s) = 10/[s(s + 2)]$. The steady-state error for a unit-ramp input is :

(1) 0.1

(2) 0.2

(3) 0.5

(4) 2

71. The characteristic equation of a feedback system is $s^3 + 4s^2 + 5s + K = 0$. The system is stable for :

(1) $0 < K < 4$

(2) $0 < K < 5$

(3) $0 < K < 20$

(4) $K > 20$

72. For a unity-feedback system with $G(s) = K/[s(s + 2)(s + 4)]$, the breakaway point of the root locus is approximately at $s =$

(1) – 3.15

(2) – 2.00

(3) – 0.85

(4) – 0.50

73. A unity-feedback system has $G(s) = 2/[s(s + 1)(s + 2)]$. Its gain margin is approximately :

(1) 3 dB

(2) 6 dB

(3) 9.5 dB

(4) 12 dB

74. A system is described by $\dot{x}_1 = x_2, \dot{x}_2 = -2x_1 - 3x_2 + u, y = x_1$. Its transfer function $Y(s)/U(s)$ is :

(1) $2/(s^2+3s+1)$

(2) $1/(s^2+2s+3)$

(3) $s/(s^2+3s+2)$

(4) $1/(s^2+3s+2)$

75. A 500 V

power

(1) 6

(3)

76. An

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(1

(

77.

75. A 500 W carrier is amplitude modulated to a depth of 80% by a sinusoid. The power in each sideband is :

(1) 660 W

(2) 40 W

(3) 160 W

(4) 80 W

76. An FM signal is $s(t) = 10 \cos [2\pi \times 10^6 t + 5 \sin (2\pi \times 2 \times 10^3 t)]$. Using Carson's rule, its bandwidth is approximately :

(1) 4 kHz

(2) 12 kHz

(3) 20 kHz

(4) 24 kHz

77. A superheterodyne receiver with IF = 455 kHz and a high-side local oscillator is tuned to 1000 kHz. The image frequency is :

(1) 455 kHz

(2) 1455 kHz

(3) 1910 kHz

(4) 2365 kHz

78. White noise with two-sided power spectral density 10^{-9} W/Hz is passed through an ideal unity-gain low-pass filter that passes $|f| \leq 1$ MHz. The output noise power is :

(1) 1 μW (2) 1 mW

(3) 2 mW (4) 4 mW

79. A channel of bandwidth 4 kHz has a signal-to-noise ratio of 15 (linear). According to the Shannon-Hartley theorem, its capacity is :

(1) 16 kbps (2) 32 kbps

(3) 60 kbps (4) 8 kbps

80. A rectangular pulse of amplitude 2 V and duration 1 μs is received in white Gaussian noise of two-sided PSD $N_0/2$, with $N_0 = 2\times 10^{-6}$ W/Hz (1 Ω reference). The maximum output SNR of a matched filter is :

(1) 1 (2) 2

(3) 4 (4) 8

81. A baseband system transmits 4 Msymbols/s using raised-cosine pulses with roll-off factor 0.5. The minimum bandwidth required for ISI-free transmission is :

(1) 6 MHz (2) 4 MHz

(3) 3 MHz (4) 2 MHz

82. A Hamming code uses 4 parity bits. The parameters (n, k) of this code are :

(1) (31, 26)

(2) (15, 11)

(3) (11, 7)

(4) (7, 4)

83. At the interface between two lossless dielectrics of different permittivities carrying no free surface charge, which of the following is continuous across the boundary ?

(1) The normal component of D

(2) The tangential component of D

(3) The normal component of E

(4) The normal component of the polarisation vector P

84. The skin depth of copper at 1 MHz is about 66 μm. At 100 MHz its skin depth is approximately :

(1) 660 μm

(2) 66 μm

(3) 6.6 μm

(4) 0.66 μm

85. A uniform plane wave in air is normally incident on a semi-infinite lossless non-magnetic dielectric of relative permittivity 9. The fraction of the incident power that is reflected is :

(1) 75%

(2) 50%

(3) 25%

(4) 11%

86. A 50 Ω lossless line is to be matched to a 200 Ω resistive load using a quarter-wave transformer. The characteristic impedance of the transformer section must be :

(1) 100 Ω

(2) 150 Ω

(3) 125 Ω

(4) 75 Ω

87. A 50 Ω lossless transmission line is terminated by a 150 Ω resistive load. The return loss ($-20 \log |S_{11}|$) at the load is approximately :

(1) 6 dB

(2) 9.5 dB

(3) 3 dB

(4) 12 dB

88. An air-filled rectangular waveguide of cross-section 4 cm × 2 cm is excited at 6 GHz. The modes that can propagate are :

(1) TE_{10} and TE_{20}

(2) TE_{10}, TE_{20} and TE_{01}

(3) TE_{10} and TE_{01}

(4) Only TE_{10}

89. A step-index optical fibre has a core refractive index of 1.50 and a cladding index of 1.46. Its numerical aperture is approximately :

(1) 0.34

(2) 0.54

(3) 0.04

(4) 0.17

90. Two identical isotropic radiators are spaced $\lambda/2$ apart and fed with equal-amplitude currents that are 180° out of phase. The direction(s) of maximum radiation is/are :

(1) Perpendicular to the line joining the elements (broadside)

(2) At 45° to the line joining the elements

(3) At 60° to the line joining the elements

(4) Along the line joining the elements (end-fire)

91. A 12 V source in series with a 6 Ω resistor is connected across a 3 Ω resistor. A variable load resistor R_L is connected in parallel with the 3 Ω resistor. The maximum power that can be delivered to R_L is :

(1) 8 W (2) 4 W

(3) 2 W (4) 1 W

92. A series RLC circuit has R = 2 Ω, L = 1 mH and C = 10 μF. Its quality factor at resonance is :

(1) 2.5 (2) 5

(3) 10 (4) 20

93. The inverse Laplace transform of $F(s) = 1/1[s(s + 2)]$, $Re\{s\} > 0$, is :

(1) $\frac{1}{2}(1-e^{-2t})u(t)$

(2) $\frac{1}{2}e^{-2t}u(t)$

(3) $(1-e^{-2t})u(t)$

(4) $\frac{1}{2}(1+e^{-2t})u(t)$

94. A symmetrical T-network has each series arm equal to 2 Ω and the shunt arm equal to 4 Ω. The transmission (ABCD) parameter B of this two-port is :

(1) 2.5 Ω (2) 5 Ω

(3) 8 Ω (4) 10 Ω

95. The signal $x(t) = \cos(2000\pi t) \cdot \cos(4000\Omega t)$ is to be sampled. The minimum sampling rate that avoids aliasing is :

(1) 12 kHz

(2) 6 kHz

(3) 4 kHz

(4) 3 kHz

96. The 4-point DFT X[k] of $x[n] = \{1, 2, 3, 4\}$ has X[1] equal to :

(1) $-2 + j2$

(2) $2 + j2$

(3) $-2 - j2$

(4) 10

97. A discrete-time LTI system has $H(z) = 1/[(1 - 0.5z^{-1})(1 - 2z^{-1})]$. If the system is stable, its impulse response $h[n]$ is :

(1) Two-sided (neither causal nor anti-causal)

(2) Anti-causal (left-sided)

(3) Causal and right-sided

(4) Of finite duration

98. The group delay of the FIR system with impulse response $h[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$ is :

(1) 0 sample

(2) 1 sample at all frequencies

(3) 2 samples at all frequencies

(4) Frequency dependent

99. In silicon at 300 K, $n_i = 1.5 \times 10^{10}$ cm^{-3}. A sample is doped with donors $N_D = 1.5 \times 10^{16}$ cm^{-3} and no acceptors. The equilibrium hole concentration is approximately :

(1) 1.5×10^{10} cm^{-3}

(2) 1.5×10^{16} cm^{-3}

(3) 1.5×10^{6} cm^{-3}

(4) 1.5×10^{4} cm^{-3}

100. An illuminated *p-n* junction solar cell delivers power to the load when it operates in which quadrant of its I-V characteristic (current taken positive in the forward-diode direction) ?

(1) First quadrant

(2) Second quadrant

(3) Third quadrant

(4) Fourth quadrant

Total No. of Printed Pages : 28

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

PH.D.-EE-October, 2026 (Electronics and Comm. Engg. (UIET))

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100011

Sr. No. .....

Time : 1¼ Hours **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet / OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answers (1), (2), (3), (4) are given. The candidate is to choose only one answer which he / she considers the correct or best one. If the candidate darkens more than one circle or cutting / over writing / erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection / complaint, if any, with regard to discrepancy in the question booklet / answer key within 24 hours of uploading the same on the University website. The complaint be sent by the student to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehavior will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

SEAL

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1. The author-date in-text citation system, e.g., (Smith, 2020), is a characteristic of :

(1) Vancouver style

(2) APA style

(3) IEEE style

(4) Numbered footnote system

2. In footnote referencing, 'Ibid.' is used to refer to :

(1) An unpublished source with no known author

(2) A work cited earlier, but not in the immediately preceding footnote

(3) The full bibliography at the end of the thesis

(4) The work cited in the immediately preceding footnote

3. A bibliography differs from a reference list in that a bibliography :

(1) is placed only at the beginning of the thesis

(2) lists only the works cited in the text

(3) may include works consulted but not directly cited in the text

(4) contains only web-based sources

4. The Journal Impact Factor for year Y is computed as :

(1) Citations received by the journal's five most-cited papers ÷ five

(2) Total number of papers published in year Y ÷ total citations received in year Y

(3) Citations in year Y to items published in the previous two years ÷ number of citable items published in those two years

(4) Number of papers published by the journal ÷ number of its reviewers

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5. A researcher's six papers have been cited 10, 8, 5, 4, 3 and 0 times. Her h-index is :

(1) 3
(2) 5
(3) 4
(4) 6

6. In a double-blind peer review process :

(1) The authors know the reviewers' identities but not vice versa
(2) Neither the authors nor the reviewers know each other's identities
(3) The editor alone judges the paper without any external reviewer
(4) The reviewers know the authors' identities but not vice versa

7. The mean of 10 observations is 20 and the mean of another 15 observations is 30. The combined mean of all 25 observations is :

(1) 26
(2) 25
(3) 22
(4) 28

8. A vehicle travels a certain distance at 60 km/h and returns over the same distance at 40 km/h. The average speed for the whole journey is :

(1) 48 km/h
(2) 50 km/h
(3) 52 km/h
(4) 45 km/h

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9. For a moderately skewed distribution, the mean is 20 and the median is 18. Using the empirical relation, the mode is approximately :

(1) 18

(2) 16

(3) 12

(4) 14

10. The (population) standard deviation of the data 2, 4, 4, 4, 5, 5, 7, 9 is :

(1) 2.5

(2) 2

(3) 1.5

(4) 4

11. In simple linear regression, the correlation coefficient between X and Y is $r = -0.8$. The coefficient of determination is :

(1) 0.80

(2) -0.64

(3) 0.64

(4) 0.89

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12. A Type I error occurs when :

(1) A true null hypothesis is rejected

(2) A true null hypothesis is accepted

(3) A false null hypothesis is rejected

(4) A false null hypothesis is accepted

13. In hypothesis testing, a p-value of 0.03 means that :

(1) If the null hypothesis were true, data at least as extreme as that observed would occur with probability 0.03

(2) The effect size is 3% of the population mean

(3) The probability that the null hypothesis is true is 0.03

(4) There is a 97% probability that the result will be replicated

14. To test whether the means of three or more independent groups differ significantly, the appropriate parametric test is :

(1) Paired t-test

(2) Chi-square test

(3) Z-test for a single proportion

(4) One-way ANOVA (F-test)

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15. The Chi-square test of independence is used to examine :

(1) The equality of means across several groups

(2) The association between two categorical variables

(3) The linear correlation between two interval-scale variables

(4) The difference between two population means

16. In a normal distribution, approximately what percentage of the observations lie within ± 2 standard deviations of the mean ?

(1) 50%

(2) 68%

(3) 95%

(4) 99.9%

17. In Microsoft Excel, the function that computes the sample standard deviation of a data range is :

(1) STDEV.P

(2) AVEDEV

(3) STDEV.S

(4) VAR.P

18. Which of the following tools is primarily used to check manuscripts and theses for textual similarity (possible plagiarism) ?

(1) SPSS

(2) LaTeX

(3) Zotero

(4) Turnitin

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19. In a data set $Q_1 = 20$ and $Q_3 = 40$. Using Tukey's 1.5 × IQR rule, an observation is flagged as a high outlier if it exceeds :

(1) 50 (2) 70

(3) 60 (4) 80

20. The decimal equivalent of $(1011.101)_2$ is :

(1) 11.125 (2) 11.5

(3) 13.625 (4) 11.625

21. The hexadecimal equivalent of the decimal number 173 is :

(1) 9D (2) AD

(3) BD (4) AB

22. The hexadecimal equivalent of the octal number $(745)_8$ is :

(1) 2E5 (2) 1E5

(3) 1F5 (4) 1D5

23. The sum of the binary numbers $(110110)_2$ and $(101011)_2$ is :

(1) 1100001 (2) 1101001

(3) 1011001 (4) 1100011

24. The sum of the hexadecimal numbers $(3F)_{16}$ and $(2B)_{16}$ is :

(1) 6B (2) 5A

(3) 6A (4) 7A

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25. Research carried out to find a solution to an immediate practical problem faced by an industry or society is termed as :

(1) Historical research

(2) Fundamental (pure) research

(3) Applied research

(4) Exploratory research

26. Which of the following is the first step in the research process ?

(1) Identifying and defining the research problem

(2) Writing the final research report

(3) Drawing inferences and generalisations

(4) Collecting primary data

27. A study that applies signal-processing techniques to diagnose cardiac disorders from ECG records combines concepts from engineering and medicine. Such research is best described as :

(1) Historical research

(2) Philosophical research

(3) Longitudinal research

(4) Interdisciplinary research

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28. Which sequence correctly represents the hypothetico-deductive scientific method ?

(1) Conclusion → experimentation → observation → hypothesis → deduction

(2) Experimentation → hypothesis → observation → deduction → conclusion

(3) Hypothesis → conclusion → observation → experimentation → deduction

(4) Observation → formulation of hypothesis → deduction of testable consequences → testing/experimentation → acceptance or rejection of hypothesis

29. According to Karl Popper, the criterion that distinguishes a scientific hypothesis from a non-scientific one is its :

(1) Verifiability through the opinion of recognised authorities

(2) Use of complex mathematical formulation

(3) Falsifiability, i.e., it can in principle be refuted by observation or experiment

(4) Acceptance by a majority of scientists

30. In a study of the effect of temperature on the resistance of a metallic wire, the resistance is the :

(1) Independent variable

(2) Dependent variable

(3) Moderating variable

(4) Extraneous variable

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31. Which of the following is the LEAST appropriate criterion for selecting a research topic ?

(1) Choosing it because it is certain to confirm the researcher's existing beliefs

(2) Availability of literature, data and other resources

(3) Its originality and potential contribution to the field

(4) Feasibility within the available time frame

32. The primary purpose of a literature review at the start of a research project is :

(1) To identify gaps in existing knowledge and avoid duplication of earlier work

(2) To obtain raw data for the final statistical analysis

(3) To increase the number of pages in the thesis

(4) To select the sample for the study

33. Publishing the results of a single study in several fragmentary papers merely to inflate the publication count is known as :

(1) Ghost authorship

(2) Salami slicing

(3) Gift authorship

(4) Data fabrication

34. Manipulating research materials or processes, or changing or omitting data so that the research record is not accurately represented, is called :

(1) Falsification

(2) Fabrication

(3) Self-citation

(4) Plagiarism

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35. The primary function of an Institutional Ethics Committee (Institutional Review Board) is :

(1) To decide the order of authors in publications

(2) To fund approved research projects

(3) To check manuscripts for textual similarity before publication

(4) To protect the rights, safety and well-being of human participants by reviewing research proposals

36. According to the ICMJE criteria, which of the following alone does *not* qualify a person for authorship ?

(1) Drafting the work or revising it critically for important intellectual content

(2) Substantial contribution to the conception, design or data analysis of the work

(3) Final approval of the version to be published and agreeing to be accountable for the work

(4) Securing funding or providing general supervision of the research group

37. The question 'Do you think the college library is well stocked and its staff courteous ?' is an example of a/an :

(1) Double-barrelled question

(2) Leading question

(3) Open-ended question

(4) Loaded question

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38. Which statement correctly distinguishes a schedule from a questionnaire ?

(1) In a schedule the questions are asked and filled in by an enumerator, whereas in a questionnaire the respondent fills in the answers

(2) A schedule contains only open-ended questions, whereas a questionnaire contains only closed-ended questions

(3) A schedule is mailed to respondents, whereas a questionnaire is administered by an enumerator

(4) A schedule is used only for collecting secondary data

39. The main purpose of a pilot study (pre-test) is to :

(1) Replace the main survey when the population is large

(2) Obtain the final results of the research

(3) Test and refine the research instrument and procedure on a small sample before the main study

(4) Avoid the need for ethical clearance

40. An unstructured interview is characterised by :

(1) Absence of an interviewer

(2) Exclusively closed-ended questions with coded options

(3) A fixed set of identical questions asked in a fixed order

(4) Flexible wording and order of questions that may evolve during the conversation

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41. When the observer becomes a member of the group being studied and takes part in its activities, the technique is called :

(1) Non-participant observation

(2) Content analysis

(3) Structured questionnaire survey

(4) Participant observation

42. A Likert scale is :

(1) A summated rating scale in which respondents indicate their degree of agreement or disagreement with statements

(2) A technique to map social relationships among group members

(3) A bipolar-adjective scale known as the semantic differential

(4) A ratio scale used to measure physical length

43. Which of the following is an example of secondary data ?

(1) Responses obtained by the researcher through a self-administered survey

(2) Interview transcripts collected by the researcher

(3) Population figures taken from the published Census report

(4) Readings recorded by the researcher in his own laboratory experiment

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44. In stratified random sampling the population is first :

(1) Arranged in a list and every k-th unit is selected from a random start

(2) Divided into homogeneous, non-overlapping subgroups, and a random sample is drawn from each

(3) Approached through referrals from the initial respondents

(4) Divided into heterogeneous clusters, and some clusters are selected entirely at random

45. Which of the following is a non-probability sampling technique ?

(1) Snowball sampling

(2) Stratified random sampling

(3) Simple random sampling

(4) Systematic random sampling

46. If the sample size is increased from 100 to 400 (population standard deviation unchanged), the standard error of the sample mean :

(1) remains unchanged

(2) is doubled

(3) is reduced to one-fourth

(4) is halved

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47. Cronbach's alpha is commonly used to assess the :

(1) Normality of a data distribution

(2) Internal consistency reliability of a multi-item scale

(3) External validity of an experiment

(4) Sampling error of a survey

48. In an IMRaD-structured research paper, the details that allow other researchers to replicate the study are given in the :

(1) Acknowledgements

(2) Introduction

(3) Discussion

(4) Methods section

49. Which of the following is normally placed in the preliminary pages (front matter) of a thesis ?

(1) Bibliography

(2) Concluding chapter

(3) Appendices

(4) Table of contents

50. Which of the following is the most important pre-writing consideration in report writing ?

(1) Analysing the purpose of the report and the needs of its intended readers

(2) Choosing the binding style of the final copy

(3) Selecting the font colour

(4) Deciding the number of copies to be printed

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51. An ADC with an input range of 0 – 10 V must resolve changes of 5 mV or better. The minimum number of bits required is :

(1) 12

(2) 11

(3) 10

(4) 9

52. A 5-stage instruction pipeline has a stage delay of 1 ns. Assuming no hazards or stalls, the time needed to execute 100 instructions is :

(1) 100 ns

(2) 104 ns

(3) 105 ns

(4) 500 ns

53. A unity-feedback system has open-loop transfer function $G(s) = 25/[s(s + 6)]$. The percentage peak overshoot of its unit-step response is approximately :

(1) 25%

(2) 16.3%

(3) 9.5%

(4) 4.6%

54. A unity-feedback system has $G(s) = 10/[s(s + 2)]$. The steady-state error for a unit-ramp input is :

(1) 0.1

(2) 0.2

(3) 0.5

(4) 2

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55. The characteristic equation of a feedback system is $s^3 + 4s^2 + 5s + K = 0$. The system is stable for :

(1) $0 < K < 4$

(2) $0 < K < 5$

(3) $0 < K < 20$

(4) $K > 20$

56. For a unity-feedback system with $G(s) = K/[s(s + 2)(s + 4)]$, the breakaway point of the root locus is approximately at $s =$

(1) -3.15

(2) -2.00

(3) -0.85

(4) -0.50

57. A unity-feedback system has $G(s) = 2/[s(s + 1)(s + 2)]$. Its gain margin is approximately :

(1) 3 dB

(2) 6 dB

(3) 9.5 dB

(4) 12 dB

58. A system is described by $\dot{x}_1 = x_2$, $\dot{x}_2 = -2x_1 - 3x_2 + u$, $y = x_1$. Its transfer function $Y(s)/U(s)$ is :

(1) $2/(s^2 + 3s + 1)$

(2) $1/(s^2 + 2s + 3)$

(3) $s/(s^2 + 3s + 2)$

(4) $1/(s^2 + 3s + 2)$

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59. A 500 W carrier is amplitude modulated to a depth of 80% by a sinusoid. The power in each sideband is :

(1) 660 W

(2) 40 W

(3) 160 W

(4) 80 W

60. An FM signal is $s(t) = 10 \cos [2\pi \times 10^6 t + 5 \sin (2\pi \times 2 \times 10^3 t)]$. Using Carson's rule, its bandwidth is approximately :

(1) 4 kHz

(2) 12 kHz

(3) 20 kHz

(4) 24 kHz

61. A superheterodyne receiver with IF = 455 kHz and a high-side local oscillator is tuned to 1000 kHz. The image frequency is :

(1) 455 kHz

(2) 1455 kHz

(3) 1910 kHz

(4) 2365 kHz

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62. White noise with two-sided power spectral density 10^{-9} W/Hz is passed through an ideal unity-gain low-pass filter that passes $|f| \leq 1$ MHz. The output noise power is :

(1) 1 μW
(2) 1 mW
(3) 2 mW
(4) 4 mW

63. A channel of bandwidth 4 kHz has a signal-to-noise ratio of 15 (linear). According to the Shannon-Hartley theorem, its capacity is :

(1) 16 kbps
(2) 32 kbps
(3) 60 kbps
(4) 8 kbps

64. A rectangular pulse of amplitude 2 V and duration 1 μs is received in white Gaussian noise of two-sided PSD $N_0/2$, with $N_0 = 2\times 10^{-6}$ W/Hz (1 Ω reference). The maximum output SNR of a matched filter is :

(1) 1
(2) 2
(3) 4
(4) 8

65. A baseband system transmits 4 Msymbols/s using raised-cosine pulses with roll-off factor 0.5. The minimum bandwidth required for ISI-free transmission is :

(1) 6 MHz
(2) 4 MHz
(3) 3 MHz
(4) 2 MHz

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66. A Hamming code uses 4 parity bits. The parameters (n, k) of this code are :

(1) (31, 26)

(2) (15, 11)

(3) (11, 7)

(4) (7, 4)

67. At the interface between two lossless dielectrics of different permittivities carrying no free surface charge, which of the following is continuous across the boundary ?

(1) The normal component of D

(2) The tangential component of D

(3) The normal component of E

(4) The normal component of the polarisation vector P

68. The skin depth of copper at 1 MHz is about 66 μm. At 100 MHz its skin depth is approximately :

(1) 660 μm

(2) 66 μm

(3) 6.6 μm

(4) 0.66 μm

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69. A uniform plane wave in air is normally incident on a semi-infinite lossless non-magnetic dielectric of relative permittivity 9. The fraction of the incident power that is reflected is :

(1) 75%

(2) 50%

(3) 25%

(4) 11%

70. A 50 Ω lossless line is to be matched to a 200 Ω resistive load using a quarter-wave transformer. The characteristic impedance of the transformer section must be :

(1) 100 Ω

(2) 150 Ω

(3) 125 Ω

(4) 75 Ω

71. A 50 Ω lossless transmission line is terminated by a 150 Ω resistive load. The return loss ($-20 \log |S_{11}|$) at the load is approximately :

(1) 6 dB

(2) 9.5 dB

(3) 3 dB

(4) 12 dB

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72. An air-filled rectangular waveguide of cross-section 4 cm × 2 cm is excited at 6 GHz. The modes that can propagate are :

(1) TE_{10} and TE_{20}

(2) TE_{10}, TE_{20} and TE_{01}

(3) TE_{10} and TE_{01}

(4) Only TE_{10}

73. A step-index optical fibre has a core refractive index of 1.50 and a cladding index of 1.46. Its numerical aperture is approximately :

(1) 0.34

(2) 0.54

(3) 0.04

(4) 0.17

74. Two identical isotropic radiators are spaced $\lambda/2$ apart and fed with equal-amplitude currents that are 180° out of phase. The direction(s) of maximum radiation is/are :

(1) Perpendicular to the line joining the elements (broadside)

(2) At 45° to the line joining the elements

(3) At 60° to the line joining the elements

(4) Along the line joining the elements (end-fire)

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75. A 12 V source in series with a 6 Ω resistor is connected across a 3 Ω resistor. A variable load resistor R_L is connected in parallel with the 3 Ω resistor. The maximum power that can be delivered to R_L is :

(1) 8 W
(2) 4 W
(3) 2 W
(4) 1 W

76. A series RLC circuit has R = 2 Ω, L = 1 mH and C = 10 μF. Its quality factor at resonance is :

(1) 2.5
(2) 5
(3) 10
(4) 20

77. The inverse Laplace transform of $F(s) = 1/1[s(s + 2)]$, $Re\{s\} > 0$, is :

(1) $\frac{1}{2}(1-e^{-2t})u(t)$

(2) $\frac{1}{2}e^{-2t}u(t)$

(3) $(1-e^{-2t})u(t)$

(4) $\frac{1}{2}(1+e^{-2t})u(t)$

78. A symmetrical T-network has each series arm equal to 2 Ω and the shunt arm equal to 4 Ω. The transmission (ABCD) parameter B of this two-port is :

(1) 2.5 Ω
(2) 5 Ω
(3) 8 Ω
(4) 10 Ω

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79. The signal $x(t) = \cos(2000\pi t) \cdot \cos(4000\Omega t)$ is to be sampled. The minimum sampling rate that avoids aliasing is :

(1) 12 kHz

(2) 6 kHz

(3) 4 kHz

(4) 3 kHz

80. The 4-point DFT X[k] of $x[n] = \{1, 2, 3, 4\}$ has X[1] equal to :

(1) $-2 + j2$

(2) $2 + j2$

(3) $-2 - j2$

(4) 10

81. A discrete-time LTI system has $H(z) = 1/[(1 - 0.5z^{-1})(1 - 2z^{-1})]$. If the system is stable, its impulse response $h[n]$ is :

(1) Two-sided (neither causal nor anti-causal)

(2) Anti-causal (left-sided)

(3) Causal and right-sided

(4) Of finite duration

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82. The group delay of the FIR system with impulse response $h[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$ is :

(1) 0 sample

(2) 1 sample at all frequencies

(3) 2 samples at all frequencies

(4) Frequency dependent

83. In silicon at 300 K, $n_i = 1.5 \times 10^{10}$ cm^{-3}. A sample is doped with donors $N_D = 1.5 \times 10^{16}$ cm^{-3} and no acceptors. The equilibrium hole concentration is approximately :

(1) 1.5×10^{10} cm^{-3}

(2) 1.5×10^{16} cm^{-3}

(3) 1.5×10^{6} cm^{-3}

(4) 1.5×10^{4} cm^{-3}

84. An illuminated *p-n* junction solar cell delivers power to the load when it operates in which quadrant of its I-V characteristic (current taken positive in the forward-diode direction) ?

(1) First quadrant

(2) Second quadrant

(3) Third quadrant

(4) Fourth quadrant

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85. A silicon p-n junction at 300 K has $N_A = N_D = 10^{16}$ cm^{-3} and $n_i = 1.5 \times 10^{10}$ cm^{-3} ($kT/q = 26$ mV). The built-in potential is approximately :

(1) 0.84 V (2) 0.70 V

(3) 0.58 V (4) 0.46 V

86. An n-channel MOSFET has $\mu_n C_{ox} (W/L) = 2$ mA/V^2 and $V_T = 1$ V. Neglecting channel-length modulation, the drain current for $V_{GS} = 3$ V and $V_{DS} = 5$ V is :

(1) 4 mA (2) 8 mA

(3) 2 mA (4) 16 mA

87. For an n-channel MOSFET, the threshold voltage increases when :

(1) The source-body junction is forward biased

(2) The substrate doping concentration is decreased

(3) The gate-oxide thickness is reduced

(4) The substrate (body) doping concentration is increased

88. In a Zener shunt regulator, $V_{in} = 12$ V, series resistance $R_s = 300\ \Omega$, $V_Z = 6$ V and the load is $R_L = 600\ \Omega$. The current through the Zener diode is :

(1) 20 mA (2) 15 mA

(3) 10 mA (4) 5 mA

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89. A sinusoidal input $v_i = 5 \sin \omega t$ V is applied through a large capacitor to a diode clamp. The ideal diode has its anode grounded and its cathode connected to the output node. In steady state the output swings between :

(1) -10 V and 0 V

(2) 0 V and $+10$ V

(3) 0 V and $+5$ V

(4) -5 V and $+5$ V

90. In a fixed-bias circuit, $V_{CC} = 12$ V, $R^B = 565$ kΩ (from V_{CC} to the base), $R_C = 2$ kΩ, $\beta = 100$ and $V_{BE} = 0.7$ V. The collector-emitter voltage in the active region is :

(1) 6 V

(2) 10 V

(3) 4 V

(4) 8 V

91. A common-source amplifier has $g_m = 2$ mS, $R_D = 5$ kΩ and $r_o = 50$ kΩ, with no load. The small-signal voltage gain is approximately :

(1) -10.0

(2) -9.1

(3) -7.5

(4) -2.0

92. In a MOS current mirror with equal channel lengths, the reference transistor has W/L = 10 and the output transistor has W/L = 60. If $I_{REF} = 50$ μA and channel-length modulation is neglected, the output current is :

(1) 600 μA

(2) 300 μA

(3) 150 μA

(4) 50 μA

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93. An ideal inverting summing amplifier has R_f = 10 kΩ and two inputs : V_1 = 1 V through 5 kΩ and V_2 = 2 V through 10 kΩ. The output voltage is :

(1) −4 V (2) −6 V

(3) +4 V (4) −2 V

94. An op-amp with saturation levels of ± 12 V is used as an inverting Schmitt trigger. Its non-inverting input is connected to ground through R_1 = 1 kΩ and to the output through R_2 = 9 kΩ. The width of the hysteresis window is :

(1) 1.2 V (2) 12 V

(3) 24 V (4) 2.4 V

95. A Wien-bridge oscillator uses two equal resistors R = 10 kΩ and two equal capacitors C = 15.9 nF in its frequency-selective network. The frequency of oscillation is approximately :

(1) 1 kHz (2) 6.28 kHz

(3) 10 kHz (4) 159 Hz

96. The IEEE-754 single-precision representation (in hexadecimal) of the decimal number − 6.5 is :

(1) C0A00000 (2) C1A00000

(3) 40D00000 (4) C0D00000

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97. The Boolean function $F(A, B, C, D) = \Sigma m(0, 2, 5, 7, 8, 10, 13, 15)$ reduces to :

(1) $B \oplus D$

(2) $B \odot D$

(3) $A \otimes C$

(4) $A \odot C$

98. The minimum number of transistors required to implement $Y = (AB + CD + E)'$ as a single static CMOS complex gate is :

(1) 14

(2) 12

(3) 10

(4) 8

99. A 64-Mbit DRAM is organised as 16M × 4 and uses row/column address multiplexing. The number of address pins required is :

(1) 24

(2) 16

(3) 12

(4) 8

100. In a synchronous design the clock-to-Q delay is 1 ns, the maximum combinational delay is 6 ns and the setup time is 1 ns. Ignoring clock skew, the maximum clock frequency is :

(1) 100 MHz

(2) 125 MHz

(3) 143 MHz

(4) 167 MHz

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PH.D.-EE-October, 2026 (Electronics and Comm. Engg. (UIET))

D

Sr. No. 100012

Time : 1¼ Hours **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet / OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answers (1), (2), (3), (4) are given. The candidate is to choose only one answer which he / she considers the correct or best one. If the candidate darkens more than one circle or cutting / over writing / erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection / complaint, if any, with regard to discrepancy in the question booklet / answer key within 24 hours of uploading the same on the University website. The complaint be sent by the student to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
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SEAL

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1. A Type I error occurs when :

(1) A true null hypothesis is rejected

(2) A true null hypothesis is accepted

(3) A false null hypothesis is rejected

(4) A false null hypothesis is accepted

2. In hypothesis testing, a p-value of 0.03 means that :

(1) If the null hypothesis were true, data at least as extreme as that observed would occur with probability 0.03

(2) The effect size is 3% of the population mean

(3) The probability that the null hypothesis is true is 0.03

(4) There is a 97% probability that the result will be replicated

3. To test whether the means of three or more independent groups differ significantly, the appropriate parametric test is :

(1) Paired t-test

(2) Chi-square test

(3) Z-test for a single proportion

(4) One-way ANOVA (F-test)

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4. The Chi-square test of independence is used to examine :

(1) The equality of means across several groups

(2) The association between two categorical variables

(3) The linear correlation between two interval-scale variables

(4) The difference between two population means

5. In a normal distribution, approximately what percentage of the observations lie within ± 2 standard deviations of the mean ?

(1) 50% (2) 68%

(3) 95% (4) 99.9%

6. In Microsoft Excel, the function that computes the sample standard deviation of a data range is :

(1) STDEV.P (2) AVEDEV

(3) STDEV.S (4) VAR.P

7. Which of the following tools is primarily used to check manuscripts and theses for textual similarity (possible plagiarism) ?

(1) SPSS (2) LaTeX

(3) Zotero (4) Turnitin

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8. In a data set $Q_1 = 20$ and $Q_3 = 40$. Using Tukey's 1.5 × IQR rule, an observation is flagged as a high outlier if it exceeds :

(1) 50 (2) 70

(3) 60 (4) 80

9. The decimal equivalent of $(1011.101)_2$ is :

(1) 11.125 (2) 11.5

(3) 13.625 (4) 11.625

10. The hexadecimal equivalent of the decimal number 173 is :

(1) 9D (2) AD

(3) BD (4) AB

11. The hexadecimal equivalent of the octal number $(745)_8$ is :

(1) 2E5 (2) 1E5

(3) 1F5 (4) 1D5

12. The sum of the binary numbers $(110110)_2$ and $(101011)_2$ is :

(1) 1100001 (2) 1101001

(3) 1011001 (4) 1100011

13. The sum of the hexadecimal numbers $(3F)_{16}$ and $(2B)_{16}$ is :

(1) 6B (2) 5A

(3) 6A (4) 7A

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14. Research carried out to find a solution to an immediate practical problem faced by an industry or society is termed as :

(1) Historical research

(2) Fundamental (pure) research

(3) Applied research

(4) Exploratory research

15. Which of the following is the first step in the research process ?

(1) Identifying and defining the research problem

(2) Writing the final research report

(3) Drawing inferences and generalisations

(4) Collecting primary data

16. A study that applies signal-processing techniques to diagnose cardiac disorders from ECG records combines concepts from engineering and medicine. Such research is best described as :

(1) Historical research

(2) Philosophical research

(3) Longitudinal research

(4) Interdisciplinary research

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17. Which sequence correctly represents the hypothetico-deductive scientific method ?

(1) Conclusion → experimentation → observation → hypothesis → deduction

(2) Experimentation → hypothesis → observation → deduction → conclusion

(3) Hypothesis → conclusion → observation → experimentation → deduction

(4) Observation → formulation of hypothesis → deduction of testable consequences → testing/experimentation → acceptance or rejection of hypothesis

18. According to Karl Popper, the criterion that distinguishes a scientific hypothesis from a non-scientific one is its :

(1) Verifiability through the opinion of recognised authorities

(2) Use of complex mathematical formulation

(3) Falsifiability, i.e., it can in principle be refuted by observation or experiment

(4) Acceptance by a majority of scientists

19. In a study of the effect of temperature on the resistance of a metallic wire, the resistance is the :

(1) Independent variable

(2) Dependent variable

(3) Moderating variable

(4) Extraneous variable

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20. Which of the following is the LEAST appropriate criterion for selecting a research topic ?

(1) Choosing it because it is certain to confirm the researcher's existing beliefs

(2) Availability of literature, data and other resources

(3) Its originality and potential contribution to the field

(4) Feasibility within the available time frame

21. The primary purpose of a literature review at the start of a research project is :

(1) To identify gaps in existing knowledge and avoid duplication of earlier work

(2) To obtain raw data for the final statistical analysis

(3) To increase the number of pages in the thesis

(4) To select the sample for the study

22. Publishing the results of a single study in several fragmentary papers merely to inflate the publication count is known as :

(1) Ghost authorship

(2) Salami slicing

(3) Gift authorship

(4) Data fabrication

23. Manipulating research materials or processes, or changing or omitting data so that the research record is not accurately represented, is called :

(1) Falsification

(2) Fabrication

(3) Self-citation

(4) Plagiarism

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24. The primary function of an Institutional Ethics Committee (Institutional Review Board) is :

(1) To decide the order of authors in publications

(2) To fund approved research projects

(3) To check manuscripts for textual similarity before publication

(4) To protect the rights, safety and well-being of human participants by reviewing research proposals

25. According to the ICMJE criteria, which of the following alone does *not* qualify a person for authorship ?

(1) Drafting the work or revising it critically for important intellectual content

(2) Substantial contribution to the conception, design or data analysis of the work

(3) Final approval of the version to be published and agreeing to be accountable for the work

(4) Securing funding or providing general supervision of the research group

26. The question 'Do you think the college library is well stocked and its staff courteous ?' is an example of a/an :

(1) Double-barrelled question

(2) Leading question

(3) Open-ended question

(4) Loaded question

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27. Which statement correctly distinguishes a schedule from a questionnaire ?

(1) In a schedule the questions are asked and filled in by an enumerator, whereas in a questionnaire the respondent fills in the answers

(2) A schedule contains only open-ended questions, whereas a questionnaire contains only closed-ended questions

(3) A schedule is mailed to respondents, whereas a questionnaire is administered by an enumerator

(4) A schedule is used only for collecting secondary data

28. The main purpose of a pilot study (pre-test) is to :

(1) Replace the main survey when the population is large

(2) Obtain the final results of the research

(3) Test and refine the research instrument and procedure on a small sample before the main study

(4) Avoid the need for ethical clearance

29. An unstructured interview is characterised by :

(1) Absence of an interviewer

(2) Exclusively closed-ended questions with coded options

(3) A fixed set of identical questions asked in a fixed order

(4) Flexible wording and order of questions that may evolve during the conversation

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30. When the observer becomes a member of the group being studied and takes part in its activities, the technique is called :

(1) Non-participant observation

(2) Content analysis

(3) Structured questionnaire survey

(4) Participant observation

31. A Likert scale is :

(1) A summated rating scale in which respondents indicate their degree of agreement or disagreement with statements

(2) A technique to map social relationships among group members

(3) A bipolar-adjective scale known as the semantic differential

(4) A ratio scale used to measure physical length

32. Which of the following is an example of secondary data ?

(1) Responses obtained by the researcher through a self-administered survey

(2) Interview transcripts collected by the researcher

(3) Population figures taken from the published Census report

(4) Readings recorded by the researcher in his own laboratory experiment

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33. In stratified random sampling the population is first :

(1) Arranged in a list and every k-th unit is selected from a random start

(2) Divided into homogeneous, non-overlapping subgroups, and a random sample is drawn from each

(3) Approached through referrals from the initial respondents

(4) Divided into heterogeneous clusters, and some clusters are selected entirely at random

34. Which of the following is a non-probability sampling technique ?

(1) Snowball sampling

(2) Stratified random sampling

(3) Simple random sampling

(4) Systematic random sampling

35. If the sample size is increased from 100 to 400 (population standard deviation unchanged), the standard error of the sample mean :

(1) remains unchanged

(2) is doubled

(3) is reduced to one-fourth

(4) is halved

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36. Cronbach's alpha is commonly used to assess the :

(1) Normality of a data distribution

(2) Internal consistency reliability of a multi-item scale

(3) External validity of an experiment

(4) Sampling error of a survey

37. In an IMRaD-structured research paper, the details that allow other researchers to replicate the study are given in the :

(1) Acknowledgements

(2) Introduction

(3) Discussion

(4) Methods section

38. Which of the following is normally placed in the preliminary pages (front matter) of a thesis ?

(1) Bibliography

(2) Concluding chapter

(3) Appendices

(4) Table of contents

39. Which of the following is the most important pre-writing consideration in report writing ?

(1) Analysing the purpose of the report and the needs of its intended readers

(2) Choosing the binding style of the final copy

(3) Selecting the font colour

(4) Deciding the number of copies to be printed

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40. The author-date in-text citation system, e.g., (Smith, 2020), is a characteristic of:

(1) Vancouver style

(2) APA style

(3) IEEE style

(4) Numbered footnote system

41. In footnote referencing, 'Ibid.' is used to refer to :

(1) An unpublished source with no known author

(2) A work cited earlier, but not in the immediately preceding footnote

(3) The full bibliography at the end of the thesis

(4) The work cited in the immediately preceding footnote

42. A bibliography differs from a reference list in that a bibliography :

(1) is placed only at the beginning of the thesis

(2) lists only the works cited in the text

(3) may include works consulted but not directly cited in the text

(4) contains only web-based sources

43. The Journal Impact Factor for year Y is computed as :

(1) Citations received by the journal's five most-cited papers ÷ five

(2) Total number of papers published in year Y ÷ total citations received in year Y

(3) Citations in year Y to items published in the previous two years ÷ number of citable items published in those two years

(4) Number of papers published by the journal ÷ number of its reviewers

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44. A researcher's six papers have been cited 10, 8, 5, 4, 3 and 0 times. Her h-index is :

(1) 3 (2) 5

(3) 4 (4) 6

45. In a double-blind peer review process :

(1) The authors know the reviewers' identities but not vice versa

(2) Neither the authors nor the reviewers know each other's identities

(3) The editor alone judges the paper without any external reviewer

(4) The reviewers know the authors' identities but not vice versa

46. The mean of 10 observations is 20 and the mean of another 15 observations is 30. The combined mean of all 25 observations is :

(1) 26 (2) 25

(3) 22 (4) 28

47. A vehicle travels a certain distance at 60 km/h and returns over the same distance at 40 km/h. The average speed for the whole journey is :

(1) 48 km/h

(2) 50 km/h

(3) 52 km/h

(4) 45 km/h

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48. For a moderately skewed distribution, the mean is 20 and the median is 18. Using the empirical relation, the mode is approximately :

(1) 18

(2) 16

(3) 12

(4) 14

49. The (population) standard deviation of the data 2, 4, 4, 4, 5, 5, 7, 9 is :

(1) 2.5

(2) 2

(3) 1.5

(4) 4

50. In simple linear regression, the correlation coefficient between X and Y is $r = -0.8$. The coefficient of determination is :

(1) 0.80

(2) -0.64

(3) 0.64

(4) 0.89

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51. White noise with two-sided power spectral density 10^{-9} W/Hz is passed through an ideal unity-gain low-pass filter that passes $|f| \leq 1$ MHz. The output noise power is :

(1) 1 μW
(2) 1 mW
(3) 2 mW
(4) 4 mW

52. A channel of bandwidth 4 kHz has a signal-to-noise ratio of 15 (linear). According to the Shannon-Hartley theorem, its capacity is :

(1) 16 kbps
(2) 32 kbps
(3) 60 kbps
(4) 8 kbps

53. A rectangular pulse of amplitude 2 V and duration 1 μs is received in white Gaussian noise of two-sided PSD $N_0/2$, with $N_0 = 2\times 10^{-6}$ W/Hz (1 Ω reference). The maximum output SNR of a matched filter is :

(1) 1
(2) 2
(3) 4
(4) 8

54. A baseband system transmits 4 Msymbols/s using raised-cosine pulses with roll-off factor 0.5. The minimum bandwidth required for ISI-free transmission is :

(1) 6 MHz
(2) 4 MHz
(3) 3 MHz
(4) 2 MHz

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55. A Hamming code uses 4 parity bits. The parameters (n, k) of this code are :

(1) (31, 26)

(2) (15, 11)

(3) (11, 7)

(4) (7, 4)

56. At the interface between two lossless dielectrics of different permittivities carrying no free surface charge, which of the following is continuous across the boundary ?

(1) The normal component of D

(2) The tangential component of D

(3) The normal component of E

(4) The normal component of the polarisation vector P

57. The skin depth of copper at 1 MHz is about 66 μm. At 100 MHz its skin depth is approximately :

(1) 660 μm

(2) 66 μm

(3) 6.6 μm

(4) 0.66 μm

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58. A uniform plane wave in air is normally incident on a semi-infinite lossless non-magnetic dielectric of relative permittivity 9. The fraction of the incident power that is reflected is :

(1) 75%

(2) 50%

(3) 25%

(4) 11%

59. A 50 Ω lossless line is to be matched to a 200 Ω resistive load using a quarter-wave transformer. The characteristic impedance of the transformer section must be :

(1) 100 Ω

(2) 150 Ω

(3) 125 Ω

(4) 75 Ω

60. A 50 Ω lossless transmission line is terminated by a 150 Ω resistive load. The return loss ($-20 \log |S_{11}|$) at the load is approximately :

(1) 6 dB

(2) 9.5 dB

(3) 3 dB

(4) 12 dB

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61. An air-filled rectangular waveguide of cross-section 4 cm × 2 cm is excited at 6 GHz. The modes that can propagate are :

(1) TE_{10} and TE_{20}

(2) TE_{10}, TE_{20} and TE_{01}

(3) TE_{10} and TE_{01}

(4) Only TE_{10}

62. A step-index optical fibre has a core refractive index of 1.50 and a cladding index of 1.46. Its numerical aperture is approximately :

(1) 0.34

(2) 0.54

(3) 0.04

(4) 0.17

63. Two identical isotropic radiators are spaced $\lambda/2$ apart and fed with equal-amplitude currents that are 180° out of phase. The direction(s) of maximum radiation is/are :

(1) Perpendicular to the line joining the elements (broadside)

(2) At 45° to the line joining the elements

(3) At 60° to the line joining the elements

(4) Along the line joining the elements (end-fire)

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64. A 12 V source in series with a 6 Ω resistor is connected across a 3 Ω resistor. A variable load resistor. R_L is connected in parallel with the 3 Ω resistor. The maximum power that can be delivered to R_L is :

(1) 8 W (2) 4 W

(3) 2 W (4) 1 W

65. A series RLC circuit has R = 2 Ω, L = 1 mH and C = 10 μF. Its quality factor at resonance is :

(1) 2.5 (2) 5

(3) 10 (4) 20

66. The inverse Laplace transform of $F(s) = 1/1[s(s + 2)]$, $Re\{s\} > 0$, is :

(1) $\frac{1}{2}(1-e^{-2t})u(t)$

(2) $\frac{1}{2}e^{-2t}u(t)$

(3) $(1-e^{-2t})u(t)$

(4) $\frac{1}{2}(1+e^{-2t})u(t)$

67. A symmetrical T-network has each series arm equal to 2 Ω and the shunt arm equal to 4 Ω. The transmission (ABCD) parameter B of this two-port is :

(1) 2.5 Ω (2) 5 Ω

(3) 8 Ω (4) 10 Ω

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68. The signal $x(t) = \cos(2000\pi t) \cdot \cos(4000\Omega t)$ is to be sampled. The minimum sampling rate that avoids aliasing is :

(1) 12 kHz

(2) 6 kHz

(3) 4 kHz

(4) 3 kHz

69. The 4-point DFT X[k] of $x[n] = \{1, 2, 3, 4\}$ has X[1] equal to :

(1) $-2 + j2$

(2) $2 + j2$

(3) $-2 - j2$

(4) 10

70. A discrete-time LTI system has $H(z) = 1/[(1 - 0.5z^{-1})(1 - 2z^{-1})]$. If the system is stable, its impulse response $h[n]$ is :

(1) Two-sided (neither causal nor anti-causal)

(2) Anti-causal (left-sided)

(3) Causal and right-sided

(4) Of finite duration

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71. The group delay of the FIR system with impulse response $h[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$ is :

(1) 0 sample

(2) 1 sample at all frequencies

(3) 2 samples at all frequencies

(4) Frequency dependent

72. In silicon at 300 K, $n_i = 1.5 \times 10^{10}$ cm^{-3}. A sample is doped with donors $N_D = 1.5 \times 10^{16}$ cm^{-3} and no acceptors. The equilibrium hole concentration is approximately :

(1) 1.5×10^{10} cm^{-3}

(2) 1.5×10^{16} cm^{-3}

(3) 1.5×10^{6} cm^{-3}

(4) 1.5×10^{4} cm^{-3}

73. An illuminated *p-n* junction solar cell delivers power to the load when it operates in which quadrant of its I-V characteristic (current taken positive in the forward-diode direction) ?

(1) First quadrant

(2) Second quadrant

(3) Third quadrant

(4) Fourth quadrant

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74. A silicon p-n junction at 300 K has $N_A = N_D = 10^{16}$ cm^{-3} and $n_i = 1.5 \times 10^{10}$ cm^{-3} ($kT/q = 26$ mV). The built-in potential is approximately :

(1) 0.84 V

(2) 0.70 V

(3) 0.58 V

(4) 0.46 V

75. An n-channel MOSFET has $\mu_n C_{ox} (W/L) = 2$ mA/V^2 and $V_T = 1$ V. Neglecting channel-length modulation, the drain current for $V_{GS} = 3$ V and $V_{DS} = 5$ V is :

(1) 4 mA

(2) 8 mA

(3) 2 mA

(4) 16 mA

76. For an n-channel MOSFET, the threshold voltage increases when :

(1) The source-body junction is forward biased

(2) The substrate doping concentration is decreased

(3) The gate-oxide thickness is reduced

(4) The substrate (body) doping concentration is increased

77. In a Zener shunt regulator, $V_{in} = 12$ V, series resistance $R_s = 300\ \Omega$, $V_Z = 6$ V and the load is $R_L = 600\ \Omega$. The current through the Zener diode is :

(1) 20 mA

(2) 15 mA

(3) 10 mA

(4) 5 mA

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78. A sinusoidal input $v_i = 5 \sin \omega t$ V is applied through a large capacitor to a diode clamp. The ideal diode has its anode grounded and its cathode connected to the output node. In steady state the output swings between :

(1) – 10 V and 0 V

(2) 0 V and + 10 V

(3) 0 V and + 5 V

(4) – 5 V and + 5 V

79. In a fixed-bias circuit, V_{CC} = 12 V, R^B = 565 kΩ (from V_{CC} to the base), R_C = 2 kΩ, β = 100 and V_{BE} = 0.7 V. The collector-emitter voltage in the active region is :

(1) 6 V

(2) 10 V

(3) 4 V

(4) 8 V

80. A common-source amplifier has g_m = 2 mS, R_D = 5 kΩ and r_o = 50 kΩ, with no load. The small-signal voltage gain is approximately :

(1) – 10.0

(2) – 9.1

(3) – 7.5

(4) – 2.0

81. In a MOS current mirror with equal channel lengths, the reference transistor has W/L = 10 and the output transistor has W/L = 60. If I_{REF} = 50 μA and channel-length modulation is neglected, the output current is :

(1) 600 μA

(2) 300 μA

(3) 150 μA

(4) 50 μA

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82. An ideal inverting summing amplifier has R_f = 10 kΩ and two inputs : V_1 = 1 V through 5 kΩ and V_2 = 2 V through 10 kΩ. The output voltage is :

(1) −4 V
(2) −6 V
(3) +4 V
(4) −2 V

83. An op-amp with saturation levels of ± 12 V is used as an inverting Schmitt trigger. Its non-inverting input is connected to ground through R_1 = 1 kΩ and to the output through R_2 = 9 kΩ. The width of the hysteresis window is :

(1) 1.2 V
(2) 12 V
(3) 24 V
(4) 2.4 V

84. A Wien-bridge oscillator uses two equal resistors R = 10 kΩ and two equal capacitors C = 15.9 nF in its frequency-selective network. The frequency of oscillation is approximately :

(1) 1 kHz
(2) 6.28 kHz
(3) 10 kHz
(4) 159 Hz

85. The IEEE-754 single-precision representation (in hexadecimal) of the decimal number − 6.5 is :

(1) C0A00000
(2) C1A00000
(3) 40D00000
(4) C0D00000

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86. The Boolean function $F(A, B, C, D) = \Sigma m\,(0, 2, 5, 7, 8, 10, 13, 15)$ reduces to :

(1) $B \oplus D$

(2) $B \odot D$

(3) $A \otimes C$

(4) $A \odot C$

87. The minimum number of transistors required to implement $Y = (AB + CD + E)'$ as a single static CMOS complex gate is :

(1) 14

(2) 12

(3) 10

(4) 8

88. A 64-Mbit DRAM is organised as 16M × 4 and uses row/column address multiplexing. The number of address pins required is :

(1) 24

(2) 16

(3) 12

(4) 8

89. In a synchronous design the clock-to-Q delay is 1 ns, the maximum combinational delay is 6 ns and the setup time is 1 ns. Ignoring clock skew, the maximum clock frequency is :

(1) 100 MHz

(2) 125 MHz

(3) 143 MHz

(4) 167 MHz

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90. An ADC with an input range of 0 – 10 V must resolve changes of 5 mV or better. The minimum number of bits required is :

(1) 12

(2) 11

(3) 10

(4) 9

91. A 5-stage instruction pipeline has a stage delay of 1 ns. Assuming no hazards or stalls, the time needed to execute 100 instructions is :

(1) 100 ns

(2) 104 ns

(3) 105 ns

(4) 500 ns

92. A unity-feedback system has open-loop transfer function $G(s) = 25/[s(s + 6)]$. The percentage peak overshoot of its unit-step response is approximately :

(1) 25%

(2) 16.3%

(3) 9.5%

(4) 4.6%

93. A unity-feedback system has $G(s) = 10/[s(s + 2)]$. The steady-state error for a unit-ramp input is :

(1) 0.1

(2) 0.2

(3) 0.5

(4) 2

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94. The characteristic equation of a feedback system is $s^3 + 4s^2 + 5s + K = 0$. The system is stable for :

(1) $0 < K < 4$

(2) $0 < K < 5$

(3) $0 < K < 20$

(4) $K > 20$

95. For a unity-feedback system with $G(s) = K/[s(s + 2)(s + 4)]$, the breakaway point of the root locus is approximately at $s =$

(1) – 3.15

(2) – 2.00

(3) – 0.85

(4) – 0.50

96. A unity-feedback system has $G(s) = 2/[s(s + 1)(s + 2)]$. Its gain margin is approximately :

(1) 3 dB

(2) 6 dB

(3) 9.5 dB

(4) 12 dB

97. A system is described by $\dot{x}_1 = x_2$, $\dot{x}_2 = -2x_1 - 3x_2 + u$, $y = x_1$. Its transfer function $Y(s)/U(s)$ is :

(1) $2/(s^2 + 3s + 1)$

(2) $1/(s^2 + 2s + 3)$

(3) $s/(s^2 + 3s + 2)$

(4) $1/(s^2 + 3s + 2)$

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98. A 500 W carrier is amplitude modulated to a depth of 80% by a sinusoid. The power in each sideband is :

(1) 660 W

(2) 40 W

(3) 160 W

(4) 80 W

99. An FM signal is $s(t) = 10 \cos [2\pi \times 10^6 t + 5 \sin (2\pi \times 2 \times 10^3 t)]$. Using Carson's rule, its bandwidth is approximately :

(1) 4 kHz

(2) 12 kHz

(3) 20 kHz

(4) 24 kHz

100. A superheterodyne receiver with IF = 455 kHz and a high-side local oscillator is tuned to 1000 kHz. The image frequency is :

(1) 455 kHz

(2) 1455 kHz

(3) 1910 kHz

(4) 2365 kHz

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Answer keys for Ph.D (E.C.E)-UIET entrance exam held on 23.10.2026				
Q. NO.	A	B	C	D
1	3	4	2	1
2	1	4	4	1
3	4	1	3	4
4	4	1	3	2
5	3	3	3	3
6	2	4	2	3
7	1	4	1	4
8	1	1	1	2
9	2	3	4	4
10	1	2	2	2
11	4	1	3	2
12	4	4	1	1
13	1	2	1	3
14	1	4	4	3
15	3	4	2	1
16	4	1	3	4
17	4	2	3	4
18	1	4	4	3
19	3	3	2	2
20	2	3	4	1
21	1	3	2	1
22	4	2	2	2
23	2	1	1	1
24	4	1	3	4
25	4	4	3	4
26	1	2	1	1
27	2	3	4	1
28	4	1	4	3
29	3	1	3	4
30	3	4	2	4
31	3	2	1	1
32	2	3	1	3
33	1	3	2	2
34	1	4	1	1
35	4	2	4	4
36	2	4	4	2
37	3	2	1	4
38	1	2	1	4
39	1	1	3	1
40	4	3	4	2
41	2	3	4	4
42	3	1	1	3
43	3	4	3	3
44	4	4	2	3
45	2	3	1	2
46	4	2	4	1
47	2	1	2	1
48	2	1	4	4
49	1	2	4	2
50	3	1	1	3

Answer keys for Ph.D (E.C.E)-UIET entrance exam held on 23.10.2026				
Q. NO.	A	B	C	D
51	3	2	2	3
52	2	1	2	1
53	1	4	3	3
54	2	3	2	3
55	2	2	3	2
56	1	4	3	1
57	1	2	3	3
58	2	2	4	3
59	4	1	4	1
60	4	4	4	1
61	2	1	3	4
62	1	4	3	1
63	4	2	1	4
64	3	3	3	3
65	2	3	3	2
66	4	2	2	1
67	2	2	1	2
68	2	2	3	2
69	1	3	3	1
70	4	2	1	1
71	1	3	1	2
72	4	3	4	4
73	2	3	1	4
74	3	4	4	2
75	3	4	3	1
76	2	4	2	4
77	2	3	1	3
78	2	3	2	2
79	3	1	2	4
80	2	3	1	2
81	3	3	1	2
82	3	2	2	1
83	3	1	4	4
84	4	3	4	1
85	4	3	2	4
86	4	1	1	2
87	3	1	4	3
88	3	4	3	3
89	1	1	2	2
90	3	4	4	2
91	3	3	2	2
92	2	2	2	3
93	1	1	1	2
94	3	2	4	3
95	3	2	1	3
96	1	1	4	3
97	1	1	2	4
98	4	2	3	4
99	1	4	3	4
100	4	4	2	3