Seat No.	

M.Phil/Ph.D. Entrance Examination, October - 2021
ENGINEERING AND TECHNOLOGY
Electronics and Telecommunication Engineering

Day and Date : Wednesday, 27 - 10 - 2021   **Total Marks : 100**
Time : 01.00 p.m. to 03.00 p.m.

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

RESEARCH METHODOLOGY

1) The main purpose of research in education is to _____

   A) Increase social status of an individual

   B) Increase job prospects of an individual

   C) Help in the personal growth of an individual

   D) Help the candidate become an eminent educationist

2) Random sampling is helpful as it is _____

   A) Reasonably accurate

   B) Free from personal biases

   C) An economical method of data collection

   D) All the above

P.T.O.

3) _____ is a preferred sampling method for the population with finite size.

    A) Systematic sampling   B) Purposive sampling

    C) Cluster sampling   D) Area sampling

4) The longitudinal approach of research deals with _____

    A) Short-term researches   B) Long-term researches

    C) Horizontal researches   D) None of the above

5) Survey research studies _____

    A) Events   B) Processes

    C) Populations   D) Circumstances

6) Which of the following is NOT the characteristic of a research?

    A) Research is systematic   B) Research is not passive

    C) Research is not a process   D) Research is problem oriented

7) A satisfactory statistical quantitative method should not possess one of the following qualities

    A) Flexibility   B) Measurability

    C) Comparability   D) Appropriateness

8) Which of the following options are the main tasks of research in modern society?

A) to discover new things

B) to keep pace with the advancement in knowledge

C) to systematically examine and critically analyse the investigations/sources with objectivity

D) all of the above

9) "One of the methods of logical reasoning process" is called

A) Induction   B) Deduction

C) Research   D) Experiment

10) Research is classified on the basis of _____ and methods.

A) Purpose   B) Intent

C) Methodology   D) Techniques

11) Facts or information's are analyzed and critical evaluation is made in

A) Survey   B) Action research

C) Analytical research   D) Pilot study

12) Which of the following is an example of primary data?

A) Book   B) Journal

C) News Paper   D) Census Report

13) Converting a question into a Researchable problem is called _____

A) Solution   B) Examination

C) Problem formulation   D) Problem Solving

14) _____ is a quality of Good Researcher.

    A)   Scientific temper   B)   Age

    C)   Money   D)   Time

15) Hypothesis must have _____

    A)   Applicability   B)   Durability

    C)   Testability   D)   Measurement

16) Survey is a _____ Study

    A)   Descriptive   B)   Fact finding

    C)   Analytical   D)   Systematic

17) _____ is a type of conclusive research that has as its major objective the description of something usually market characteristics or functions.

    A)   Exploratory research   B)   Conclusive research

    C)   Causal research   D)   Descriptive research

18) Summarizing raw data and displaying them on compact statistical tables for analysis is

    A)   Tabulation   B)   Coding

    C)   Transcription   D)   Editing

19) In which sample population is divided into different strata and sample is taken from different strata?

    A)   Quota sampling   B)   Snow ball sampling

    C)   Stratified sampling   D)   Purposive sampling

20) The first page of the research report is

    A)   Appendix   B)   Bibliography

    C)   Index   D)   Title Page

21) In a survey there is an enumerator and a _____

    A)   Guide   B)   Respondent

    C)   Supervisor   D)   Messenger

22) The main objective of _____ study's to acquire knowledge

    A)   Exploratory   B)   Descriptive

    C)   Diagnostic   D)   Descriptive and Diagnostic

23) The original source from which researcher collects information is

    A)   Primary Source   B)   Secondary Source

    C)   Both primary and secondary   D)   None of these

24) Sending Questionnaire to a respondent with a request to complete and return by post is called

    A)   Mail Survey   B)   Interview

    C)   Observation   D)   Panel

25) Action-research is:

    A)   An applied research

    B)   A longitudinal research

    C)   A research carried out to solve immediate problems

    D)   All the above

SUBJECT SPECIFIC

26) In a housing society, half of the families have a single child per family, while the remaining half have two children per family. The probability that a child picked at random, has a sibling is _____

A) 0.882   B) 0.667

C) 0.952   D) 0.712

27) For maximum power transfer between two cascaded sections of an electrical network, the relationship between the output impedance Z_1 of the first section to the input impedance Z_2 of the second section is

A) $Z_2 = Z_1$ B) $Z_2 = -Z_1$

C) $Z_2 = Z_1^*$ D) $Z_2 = -Z_1^*$

28) Consider two real valued signals, x(t) band - limited to [–500 Hz, 500Hz] and y(t) Bandlimited to [–1kHz, 1kHz]. For z(t) = x(t). y(t) the Nyquist sampling frequency (in kHz) is _____

A) 1   B) 4

C) 3   D) 7

29) In a code-division multiple access (CDMA) system with N = 8 chips, the maximum number of users who can be assigned mutually orthogonal signature sequences is _____

A) 7.99 to 8.01   B) 6.05 to 7.01

C) 8.05 to 9.01   D) 7.03 to 8.02

30) The volume under the surface z(x, y) = x + y and above the triangle in the x -y plane defined by {0 ≤ y ≤ x and 0 ≤ x ≤ 12} is _____

A) 642   B) 864

C) 702   D) 403

31) A depletion type N-channel MOSFET is biased in its linear region for use as a voltage controlled resistor. Assume threshold voltage $V_{TH} = 0.5V$, $V_{GS} = 2.0V$, $V_{DS} = 5V$, W/L = 100, $C_{OX} = 10^{-8}\,F/cm^2$ and $\mu_n = 800\,cm/V$ - s. The value of the resistance of the voltage controlled resistor (in Ω) is _____.

A) 500

B) 422

C) 654

D) 230

32) The phase margin in degrees of $G(s) = 10 / [(s+0.1)(s+1) + (s+10)]$ calculated using the asymptotic Bode plot is _____.

A) 70

B) 65

C) 48

D) 73

33) For a parallel plate transmission line, let v be the speed of propagation and Z be the characteristic impedance. Neglecting fringe effects, a reduction of the spacing between the plates by a factor of two results in

A) halving of v and no change in Z

B) no change in v and halving of Z

C) no change in both v and Z

D) halving of both v and Z

34) Consider sinusoidal modulation in an AM system. Assuming no overmodulation, the modulation index (μ) when the maximum and minimum values of the envelope, respectively, are 3V and 1 V, is _____.

A) 0.3

B) 0.4

C) 0.6

D) 0.5

35) The maximum value of the determinant among all 2×2 real symmetric matrices with trace 14 is _____.

A) 35

B) 55

C) 49

D) 25

36) A series LCR circuit is operated at a frequency different from its resonant frequency. The operating frequency is such that the current leads the supply voltage. The magnitude of current is half the value at resonance. If the values of L, C and R are 1 H, 1 F and 1Ω, respectively, the operating angular frequency (in rad/s) is _____.

A) 0.53 r/sec

B) 0.45 r/sec

C) 0.63 r/sec

D) 0.75 r/sec

37) Assume electronic charge $q = 1.6 \times 10^{-19}$ C, $kT/q = 25$ mV and electron mobility $\mu_n = 1000$ cm²/V-s. If the concentration gradient of electrons injected into a P-type silicon sample is 1×10^{21}/cm⁴, the magnitude of electron diffusion current density (in A/cm²) is _____.

A) 2,000

B) 3,000

C) 4,000

D) 5,000

38) In an 8085 microprocessor, the shift registers which store the result of an addition and the overflow bit are, respectively

A) B and F

B) A and F

C) H and F

D) A and C

39) Consider a four bit D to A converter. The analog value corresponding to digital signals of values 0000 and 0001 are 0V and 0.0625V respectively. The analog value (in Volts) corresponding to the digital signal 1111 is _____.

A) 0.9375

B) 0.8125

C) 0.7458

D) 0.6213

40) Which one of the following is a property of the solutions to the Laplace equation: $\nabla^2 f = 0$?

A) The solutions have neither maxima nor minima anywhere except at the boundaries

B) The solutions are not separable in the coordinates

C) The solutions are not continuous.

D) The solutions are not dependent on the boundary conditions.

41) An antenna pointing in a certain direction has a noise temperature of 50K. The ambient temperature is 290 K. The antenna is connected to a pre-amplifier that has a noise figure of 2 dB and an available gain of 40 dB over an effective bandwidth of 12 MHz. The effective input noise temperature T_e for the amplifier and the noise power P_{ao} at the output of the preamplifier, respectively, are

A) $T_e = 169.36$ K and $P_{ao} = 3.73 \times 10^{-10}$W

B) $T_e = 1.36$ K and $P_{ao} = 3.73 \times 10^{-10}$W

C) $T_e = 182.5$ K and $P_{ao} = 3.85 \times 10^{-10}$W

D) $T_e = 160.62$ K and $P_{ao} = 4.6 \times 10^{-10}$W

42) How many distinct values of x satisfy the equation $\sin(x)=x/2$, where x is in radians?

A) 1   B) 2

C) 3   D) 4 or more

43) The smaller angle (in degrees) between the planes $x + y + z = 1$ and $2x - y + 2z = 0$ is _____

A) 54.0 to 55.0   B) 25.0 to 30.0

C) 35.0 to 40.0   D) 45.0 to 50.0

44) The clock frequency of an 8085 microprocessor is 5MHz. If the time required to execute an instruction is 1.4 μs, then the number of T-states needed for executing the instruction is

A) 1   B) 6

C) 7   D) 8

45) A good transconductance amplifier should have
   A) High input resistance and low output resistance
   B) Low input resistance and high output resistance
   C) High input and output resistance
   D) Low input and output resistance

46) Which one of the following statements about differential pulse code modulation (DPCM) is true?
   A) The sum of message signal sample with its prediction is quantized
   B) The message signal sample is directly quantized, and its prediction is not used
   C) The difference of message signal sample and a random signal is quantized
   D) The difference of message signal sample with its predictions is quantized

47) What is the isolation technique used in monolithic IC?
   A) PN-junction   B) Dielectric junction
   C) Beam-lead junction   D) All of the mentioned

48) If a right-handed circularly polarized wave is incident normally on a plane perfect conductor, then the reflected wave will be
   A) right-handed circularly polarized
   B) left-handed circularly polarized
   C) elliptically polarized with a tilt angle of 45°
   D) horizontally polarized

49) The prefix code is also known as
   A) Instantaneous code   B) Block code
   C) Convolutional code   D) Parity bit

50) In Adaptive Delta Modulation, the slope error reduces and
   A) Quantization error decreases   B) Quantization error increases
   C) Quantization error remains same D) None of the above

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Rough Work

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