Seat No.

Total No. of Pages : 15

Ph.D. Entrance Examination 2024-25

Electronics and Telecommunication Engg.

Subject Code : 58836

Day and Date : Tuesday, 12/11/2024 **Total Marks : 100**
Time : 01.00 pm to 03.00 pm

Instruction :

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

Research Methodology

1. Research undertaken for knowledge's sake is

   A. Pure Research
   B. Action Research
   C. Pilot Study
   D. Survey

2. What is the main aim of interdisciplinary research?

   A. To bring out the holistic approach to research
   B. To create a new trend in research methodology
   C. To reduce the emphasis on a single subject in the research domain
   D. To over simplify the problem of research

3. What are the conditions in which Type-I error occurs?

A. The null hypotheses get rejected even if it is true

B. Both the null hypotheses as well as alternative hypotheses are rejected

C. The null hypotheses get accepted even if it is false

D. None of the above

4. Which one is called non-probability sampling?

A. Systematic sampling

B. Quota sampling

C. Stratified random sampling

D. Cluster sampling

5. What does the longitudinal research approach actually deal with?

A. Horizontal research

B. Long-term research

C. Short-term research

D. None of the above

6. Which of the following best describes quantitative research?

A. The collection of non-numerical data.

B. An attempt to confirm the researcher's hypothesis.

C. Research that is exploratory.

D. Research the attempts to generate a new theory

7. Final stage in the Research Process is

A. Problem formulation
B. Data Analysis
C. Report Writing
D. Data collection

8. Random sampling is also called.....

A. Availability sampling
B. Probation sampling
C. Probability sampling
D. Prospect sampling

9. Which of the following features are considered as critical in qualitative research?

A. Collecting data with the help of standardized research tools.
B. Design sampling with probability sample techniques.
C. Collecting data with bottom-up empirical evidence.
D. Gathering data with top-down schematic evidence.

10. Which of the following options are the main tasks of research in modern society?

A. To learn new things
B. To keep pace with the advancement in knowledge
C. To systematically examine and critically analyze the investigations/ sources with the objective
D. All of the above

11. Which of the following options most appropriately explains Research Ethics'?

A. It states how to write a research report flawlessly.

B. It gives the methodology of researching within social norms.

C. It governs the prevention of plagiarism.

D. It provides a common set of dos and don'ts of conducting an ethical rescarch,

12. Research towards finding causes or variables responsible for the origin, existence and subsistence of problem which is known as a -

A. Explanatory research

B. Diagnostic research.

C. Comparative research

D. Remedial research

13. A research intends to explore the result of possible factors for the organization of effective mid-day meal interventions. Which research method will be most appropriate for this study?

A. Historical method

B. Ex-post facto method

C. Descriptive survey method

D. Experimental method

14. Research conducted to find solution for an immediate problem is .....

A. Fundamental Research

B. Analytical Research

C. Survey

D. Action Research

15. How to judge the depth of any research?

A. By research duration

B. By research objectives

C. By total expenditure on research

D. By research title

16. A formal document that presents the research objectives, design of achieving these objectives, and the expected outcomes/deliverables of the study is called

A. Research design

B. Research proposal

C. Rescarch hypothesis

D. Research report

17. After formulating the research problem the research will prepare

A. Sample design

B. Data collection method

C. Research designs

D. None of these.

18. What is the major attribute of Correlation Analysis?

A. Association among variables

B. Difference among variables

C. Regression among variables

D. Variations among variables

19. How is random sampling helpful?

A. Reasonably accurate

B. An economical method of data collection

C. Free from personal biases

D. All of the above

20. Which of the following does not correspond to characteristics of research?

A. Research is not passive

B. Research is systematic

C. Research is not a problem-oriented

D. Research is not a process

21. A null hypothesis is

A. when there is no difference between the variables

B. the same as research hypothesis

C. subjective in nature

D. when there is difference between the variables

22. A research problem is not feasible only when:

A. it is researchable

B. it is new and adds something to the knowledge

C. it consists of independent and dependent variables

D. it has utility and relevance

23. The experimental study is based on

A. The manipulation of variables

B. Conceptual parameters

C. Replication of research

D. Survey of literature

24. What is the term for a specific prediction about the relationship between variables that is tested through research?

A. Hypothesis

B. Theory

C. Concept

D. Variable

25. Which research method involves studying a small group of participants in-depth to understand their experiences and perspectives?

A. Qualitative research

B. Quantitative research

C. Correlational research

D. Experimental research

SUBJECT SPECIFIC

26. An analog signal is band-limited to 4kHz, sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantized levels are assumed to be independent and equally probable. If we transmit two quantized samples per second, the information rate is bits/second.

A. 1

B. 2

C. 3

D. 4

27. Drift current in the semiconductors depends upon

A. only the electric field

B. only the carrier concentration gradient

C. both the electric field and the carrier concentration

D. both the electric field and the carrier concentration gradient

28. A Zener diode, when used in voltage stabilization circuits, is biased in

A. reverse bias region below the breakdown voltage

B. reverse breakdown region

C. forward bias region

D. forward bias constant current mode

29. In a semiconductor, if fermi energy level lies in conduction band, then the semiconductor is known as

A. Degenerative n-type

B. Non-degenerative n-type

C. Degenerative p-type

D. Non-degenerative n-type

30. In a 8085 system, a PUSH operation requires more clock cycles than a POP operation, which one of the following options is the correct reason for this?

A. For POP, the data transceivers remain in the same direction as for instruction fetch (memory to processor), whereas for PUSH their direction has to be reversed

B. Memory write operations are slower than memory read operations in an 8085 bases system.

C. The stack pointer needs to be pre-determined before writing registers in a PUSH, whereas a POP operation uses the address already in the stack pointer.

D. Order of register has to be interchanged for a PUSH operation, whereas POP uses their natural order.

31. Which of the following method is the strongest tool to determine the stability and the transient response of the system

A. Routh-Hurwitz criterion

B. Bode plot

C. Nyquist plot

D. Root locus

32. A long-channel NMOS transistor is biased in the linear region V_{DS} = 50 mV and is used as a resistance. Which one of the following statements is NOT correct?

A. If the device width W is increased, the resistance decreases

B. If the threshold voltage is reduced, the resistance decrease

C. If the device length L is increased, the resistance increases

D. If Vos is increased, the resistance increases

33. Which one of the following statements is correct about an ac-coupled common-emitter amplifier operating in the mid-band region?

A. The device parasitic capacitances behave like open circuits, whereas coupling and bypass capacitances behave like short circuits.

B. The device parasitic capacitances, coupling capacitances and bypass capacitances behave like open circuits.

C. The device parasitic capacitances, coupling capacitances and bypass capacitances behave like short circuits.

D. The device parasitic capacitances behave like short circuits, whereas coupling and bypass capacitances behave like open circuits.

34. The minimum number of 2-input NAND gates required to implement a 2-input XOR gate is

A. 4 B. 5

C. 6 D. 7

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

A. 1 B. 6

C. 7 D. 8

36. A bar of Gallium Arsenide (GaAs) is doped with Silicon such that the Silicon atoms occupy Gallium and Arsenic sites in the GaAs crystal. Which one of the following statement is true?

A. Silicon atoms act as p-type dopants in Arsenic sites and n-type dopants in Gallium sites

B. Silicon atoms act as n-type dopants in Arsenic sites and p-type dopants in Gallium sites

C. Silicon atoms act as p-type dopants in Arsenic as well as Gallium sites

D. Silicon atoms act as n-type dopants in Arsenic as well as Gallium sites

37. The Miller effect in the context of a Common Emitter amplifier explains

A. an increase in the low-frequency cutoff frequency

B. an increase in the high-frequency cutoff frequency

C. a decrease in the low-frequency cutoff frequency

D. a decrease in the high-frequency cutoff frequency

38. Three fair cubical dice are thrown simultaneously. The probability that all three dice have the same number of dots on the faces showing up is (up to third decimal place)

A. 0.028

B. 0.036

C. 0.458

D. 0.523

39. 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 resistances

D. low input and output resistance

40. 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

41. The following FIVE instructions were executed on an 8085 microprocessor.

MVI A, 33H

MVI B, 78H

ADD B

CMA

ANI 32H

The Accumulator value immediately after the execution of the fifth instruction is

A. 00H
B. 10H
C. 11H
D. 32H

42. In a DRAM,

A. periodic refreshing is not required
B. information is stored in a capacitor
C. information is stored in a latch
D. both read and write operations can be performed simultaneously

43. An npn bipolar junction transistor (BJT) is operating in the active region. If the reverse bias across the base collector junction is increased, then

A. the effective base width increases and common-emitter current gain increases
B. the effective base width increases and common-emitter current gain decreases
C. the effective base width decreases and common-emitter current gain increases
D. the effective base width decreases and common emitter current gain decreases

44. Which of the following statements is incorrect?

A. Lead compensator is used to reduce the settling time.

B. Lag compensator is used to reduce the steady state error.

C. Lead compensator may increase the order of a system.

D. Lag compensator always stabilizes an unstable system.

45. In un 8085 microprocessor, the contents of the accumulator and the carry flag are A7 (in hex) and (0, respectively. If the instruction RLC is executed then the contents of the accumulator (in hex) and the carry flag, respectively, will be

A. 4E and 0

B. 4E and 1

C. 4F and 0

D. 4F and 1

46. For a superheterodyne receiver, the intermediate frequency is 15 MHz and the local oscillator frequency is 3.5 GHz. If the frequency of the received signal is greater than the local oscillator frequency, then the image frequency (in MHz) is .....

A. 3485 MHz

B. 1255 MHz

C. 1685MHz

D. 2487 MHz

47. Consider an air-filled rectangular waveguide with dimensions a= 2.286cm and b=1.016cm. At 10GHz operating frequency, the value of the propagation constant (per meter) of the corresponding propagation mode is .....

A. 158.07

B. 148.07.

C. 137.05

D. 198.04

48. A radar operating at 5GHz uses a common antenna for transmission and reception. The antenna has again of 150 and is aligned for maximum directional radiation and reception to a regret Ikm away having radar cross-section of $3m^2$. If it transmit 100kW, then the received power (in μW) is.....

A. 0.0122 B. 0.0245

C. 0.0348 D. 0.0456

49. A silicon PN junction is forward biased with a constant current at room temperature. When the temperature is increased by 10°C, the forward bias voltage across the PN junction

A. increases by 60mV

B. decreases by 60mV

C. increases by 25mV

D. decreases by 25mV

50. A fair dice is tossed two times. The probability that the second toss results in a value that is higher than the first toss is

A. 2/36 B. 2/6

C. 5/12 D. 1/2

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- ROUGH WORK -