



Department of Electronics & Communication Engineering

GITAM Institute of Technology

GITAM (DEEMED TO BE UNIVERSITY)

(Estd. u/s 3 of the UGC Act, 1956), NAAC Accredited with 'A+' Grade
Gandhinagar Campus, Rushikonda, Visakhapatnam-530 045, A.P., India

Ph.D. Entrance Test - 2019-20 (Phase-II)

Part – A: Research Methodology

Syllabus:

What is Research; Objectives, Motivation, Types of Research. Literature Review and Technical Reading, Attributions and Citations, Building Intellectual Property Rights: Codes and Standards, Ethics in Engineering Research, Technical Writing and Publishing, Communicating Research Work: Presentation Skills, Assessing Research Quality.

Reference Books:

1. Dipankar Deb, Rajeeb Dey, Valentina E. Balas, Engineering Research Methodology, A Practical Insight for Researchers, Springer Publications, 2019
2. C. R. Kothari, Research Methodology – Methods and Techniques, New Age International Publishers, 2004.
3. David V. Thiel, Research Methods for Engineers, Cambridge University Press, 2014.

Part - B: Electronics and Communication Engineering

Syllabus:

Signals & Systems: Continuous-time signals: Fourier series and Fourier transform representations, Laplace Transforms; sampling theorem and applications, Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, Z-transform; LTI systems: definition and properties, causality, stability, impulse response, convolution.

Electronic Devices: P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED; Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

Analog circuits: Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback, Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation.

Digital circuits: Number systems; Combinatorial circuits: minimization of switching functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, multiplexers, decoders. Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: Semiconductor memories.

Communications: Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog and digital modulation schemes; matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Timing and frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Electromagnetics: Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar;

Reference Books

1. Alan V. Oppenheim, Alan S. Willsky, Signals and Systems, 2/e, Pearson Education, 1997.
2. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, 6/e, Oxford University Press, 2013
3. Jacob Millman, Christos C. Halkias, Chetan Parikh, Integrated Electronics-Analog and Digital Circuits, 2/e, Tata Mc Graw Hill, 2011.
4. Michael D. Ciletti, M. Morris Mano, Digital Design, 4/e. Pearson Education, 2007.
5. Simon Haykin, Communication Systems 4/e, Wiley Student Edition, 2002.
6. J.G. Proakis, Masood Salehi, Fundamentals of Communication Systems, 2/e, Pearson Education, 2013.
7. William H. Hayt, John A. Buck, Engineering Electromagnetics, 8/e, Tata McGraw Hill, 2012.
8. Edward C. Jordan, Keith G. Balmain, Electromagnetic Waves and Radiating Systems, 2/e, Prentice Hall, 2012.

Ph.D. Entrance Test - 2019-20 (Phase-II)

Model-Question paper

Duration: 2hours

Max Marks 70

Part – A: Research Methodology

Section - A contains : 25 questions × 1 mark = 25 Marks
Section- B contains : 15 questions × 2 marks = 30 Marks
Section-C contains : 5 questions × 3 marks = 15 Marks

Section-A

Answer the following each question carries 1 Mark
25 questions × 1 mark = 25 Marks

1. Essence of both basic and applied research lies in
 - a)Market orientation
 - b)scientific method
 - c) Performance monitoring research
 - d) costing methods
2. Which of the following is the first step in starting the research process?
 - a) Searching sources of information to locate problem.
 - b) Survey of related literature
 - c) Identification of problem
 - d) Searching for solutions to the problem
3. Research involves all the following except
 - a)Promotion
 - b)validation
 - c) Control
 - d) Testing
4. Statement of research problem is preceded by
 - a) Objectives
 - b) Introduction
 - c) Review of literature
 - d) Methodology
5. The following are the features of a good research study except
 - a)Should be replicable
 - b) Should be systematic and objective
 - c)Should be completed in 6 months
 - d)Should be ethical and unbiased
6. Applied research is directed towards
 - a) Problem solving
 - b)Action oriented research
 - b) Real time problems
 - d) All of the above
7. The primary objective of ----- is to provide insights into and an understanding of the problem confronting the researcher
 - a) Exploratory research
 - b) Conclusive research
 - c) Casual research
 - d) Descriptive research
8. Qualitative research is
 - a) is essentially same as the quantitative research
 - b) Employs rigorous mathematical analysis
 - c) is subjective in nature
 - d) is objective in nature
9. In compare to the primary data, secondary data can be collected
 - a) Rapidly and easily
 - b) At a relatively low cost

c) In a short time with less effort d) All of the above

10. Which of the following gives the measure of the consistency of data?

a) Mean b) Standard deviation c) Mode d) Median

11. Descriptive research is conducted for all the following reasons except

- a) To describe the characteristics of the relevant groups, such as consumers, company personnel, organizations or territories
- b) To determine the occurrence of study variables
- c) To understand which variables are the cause and which variables are the effect of a phenomenon
- d) To determine the perceptions of construction and their features

12. The practice of someone's work/idea/paper as one's without proper acknowledgement is termed as

a) Citation b) plagiarism c) Referencing d) none of the above

13. In the process of conducting research 'Formulation of Hypothesis' is followed by

- a) Statement of Objectives b) Analysis of Data
- c) Selection of Research Tools d) Collection of Data

14. A research paper is a brief report of research work based on

- a) Primary Data only b) Secondary Data only
- c) Both Primary and Secondary Data d) None of the above

15. Conference proceedings are considered as.....documents.

a) Conventional b) Primary c) Secondary d) Tertiary

16. Which of the following is not a "Graphic representation" ?

a) Pie Chart b) Bar Chart c) Table d) Histogram

17. One of the following search engine is exclusively meant for scientific information :

a) Google b) Yahoo c) SCIRUS d) Altavista

18. What is full form of IPR
 a) Intellectual property rights b) Intelligent property right
 c) Intellectual property right d) Intelligent property rotation
19. Protocol means.....
 a) Interchange of data between two devices b) Interchange of data between two computers
 c) Linkage between two computers d) Linkage between two devices
20. Questionnaire is
 a) Research method b) Measurement technique
 c) Tool for data collection d) Data analysis technique
21. A Research Report is a formal statement of
 a) Research process c) Data collection b) Research Problem d) Data Editing
22. A short summary of technical report is called
 a) Article b) Research Abstract c) Publication d) Guide
23. Ethical Neutrality is a feature of
 a) Deduction b) Scientific method c) Observation d) experience
24. Scientific method is committed to
 a) Objectivity b) Ethics c) Proposition d) Neutrality
25. Research method is a part of
 a) Problem b) Experiment c) Research Techniques d) Research Methodology

Section-B

**Answer the following each question carries 2 Marks
 15 questions × 2 marks= 30 Marks**

26. Before searching you should define the timeframe of your search. Why?
 a) So you don't find the library busy b) So you find the most articles
 c) So you work when you are most efficient d) So you do not incur unnecessary costs
27. Why is it important for a researcher to review the literature?
 a) Because it is traditional b) Because it will find if anyone has done the work before
 c) Because it identifies like-minded researchers d) Because it shows time has been spent on the subject

28. The literature review will examine:

- a) all aspects of a topic
- b) only facts
- c) only one side of the main argument
- d) only opinions

29. Writing your research objectives clearly helps to

- a) Define the focus of your study
- b) Clearly identify variables to be measured
- c) Indicate the various steps to be involved
- d) Establish the limits of the study
- e) All of the above

30. The starting point for a literature search is

- a) tertiary data
- b) secondary data
- c) primary data
- d) some other data

31. Researchers need to be cautious of some material, particularly material found online. Why?

- a) It has been used before
- b) The quality is unknown
- c) The authors name often does not appear
- d) It is too recent

32. What do you mean by citation

- a) A citation allows authors to provide the source of any quotations, ideas, and information on the copyrighted works of other authors
- b) A citation allows authors to provide the source of any quotations, ideas, and information on the copyrighted works of own work
- c) Citation is not typically related to copy right works
- d) none of the above

33. When you discover that an author has, (1) cited another author (2) it is good practice to:

- a) not to use the work
- b) use the work and attribute it to author 1
- c) use the work and attribute it to author 2
- d) locate and read the original, then attribute it to author 2

34. What are the important things when giving a presentation

- a) Introduce yourself by name
- b) Slow down when you are speaking
- c) Make eye contact with the audience
- d) Ask for questions from the audience at the conclusion of presentation
- e) All of the above

35. The objective of the communication is

- a) Specific
- b) Measurable
- c) Attainable
- d) Results – oriented and Time-limited
- e) All of the above

36. A side bar is used to
- a) Useful way of physically framing the text and giving shape to the document.
 - b) Highly necessary
 - c) Used to provide extra information such as organization, or publication; copyright, contact information
 - d) both a& b is correct
 - e) both a&c is correct
37. Which is the major disadvantage of using peer-reviewed journals in literature reviews?
- a) The information is too recent
 - b) Humans control the quality
 - c) Subscription fees are high
 - d) Information could be as old as four years
- 38 Which of these will NOT help you to decide whether a publication is reputable?
- a) Advertising inside
 - b) Citation rate
 - c) Audience
 - d) Importance to peers
39. When you cite Internet resources, you do not need to find
- a) date created
 - b) date of birth of the author
 - c) date last updated
 - d) date of access
40. Which of these is the most efficient way to locate relevant journals?
- a) Searching using tertiary sources
 - b) Browsing the shelves in the library
 - c) Browsing in a newsagents
 - d) Following up references in articles

Section- C

**Answer the following each question carries 3 Marks
5 questions × 3 marks= 15 Marks**

41. What do you think might happen if you started a research project, but hadn't written any clear research objectives?
- a) Confusion about the limits of study
 - b) Collection of data is unlimited
 - c) identify barriers and concerns
 - d) only a is correct
 - e) both a &b is correct
42. Surveying the literature involves
- a) Narrow the problem itself
 - b) identify the gaps
 - c) limited information about the existing theories
 - d) b is correct
 - e) both a& b is correct
- 43.The purpose of attribution is
- a) similar to citation
 - b) not similar to citation
 - c) Used to quote (or paraphrase **all or a portion** of an openly licensed work
 - d) both a &c
 - e) none of the above
44. Who is responsible for plagiarism?
- a) Lecturers and supervisors
 - b)The participant
 - c) Institution
 - d) The researcher
 - e) All of the above
45. How do you prepare for presentation?
- a) Writing main argument or conclusion
 - b) Writing the main points as headings
 - c) Timing the presentation & discuss the main issue by clear opening and closing line remarks
 - d) all of the above
 - e) only a& b

Part - B: Electronics and Communication Engineering

Section - A contains : 25 questions × 1 mark = 25 Marks
Section- B contains : 15 questions × 2 marks = 30 Marks
Section-C contains : 5 questions × 3 marks = 15 Marks

Section-A

Answer the following each question carries 1 Mark
25 questions × 1 mark = 25 Marks

1. The unit of $\nabla \times \mathbf{H}$ is
 - (a) Ampere
 - (b) Ampere/meter
 - (c) Ampere/meter²
 - (d) Ampere-meter
2. The divergence of a vector field $\mathbf{A} = x\mathbf{a}_x + y\mathbf{a}_y + z\mathbf{a}_z$ is
 - (a) 0
 - (b) 1
 - (c) 1/3
 - (d) 3
3. Which of the following analog modulation scheme requires the minimum transmitted power and minimum channel bandwidth?
 - (a) VSB
 - (b) DSB-SC
 - (c) SSB
 - (d) AM
4. The amplitude spectrum of a Gaussian pulse is
 - (a) Uniform
 - (b) A sine function
 - (c) Gaussian
 - (d) An impulse function
5. The digit F in hexadecimal system has equivalence in digital system to
 - (a) 16
 - (b) 15
 - (c) 17
 - (d) 18
6. Which is known as flash converter
 - (a) Weighted resistor D/A converter
 - (b) Parallel A/D converter

- (c) Stair step A/D converter
- (d) Up-down counter type A/D converter

7. A circuit that removes positive or negative parts of waveform is called

- (a) Clamper
- (b) Clipper
- (c) Diode clamp
- (d) Amplifier

8. An operational amplifier can amplify

- (a) AC signals only
- (b) DC signals only
- (c) Both ac and dc signals
- (d) Neither ac nor dc signals

9. For silicon, the energy gap at 300K is

- (a) 1.1W
- (b) 1.1J
- (c) 1.1eV
- (d) None of these

10. The process of adding impurities to a pure semiconductor is called

- (a) Mixing
- (b) Doping
- (c) Diffusing
- (d) None of these

11. The trigonometric Fourier series of an even function of time does not have
- (a) The dc term
 - (b) Cosine terms
 - (c) Sine terms
 - (d) Odd harmonic terms
12. A band limited signal is sampled at the Nyquist rate. The signal can be recovered by passing the samples through
- (a) An high pass filter
 - (b) An envelope detector
 - (c) A PLL
 - (d) An ideal low-pass filter with appropriate bandwidth
13. The region of convergence of the Z-transform of a unit step function is
- (a) Magnitude of $Z > 1$
 - (b) Magnitude of $Z < 1$
 - (c) Real part of $Z > 0$
 - (d) Real part of $Z < 0$
14. Which of the following is **not** associated with a p-n junction?
- (a) Junction capacitance
 - (b) Charge storage capacitance
 - (c) Depletion capacitance
 - (d) Channel length modulation
15. The main advantage of CMOS is its
- (a) High power rating
 - (b) Small signal operation
 - (c) Switching capability
 - (d) Low power consumption
16. A Schmitt trigger uses
- (a) Positive feedback
 - (b) Negative feedback
 - (c) Compensating capacitors
 - (d) Pull up transistors

17. The ideal value of stability factor of a biasing circuit is
- (a) 1
 - (b) 5
 - (c) 10
 - (d) 100
18. Indicate which of the following logic gates can be used to realize all possible combination logic functions
- (a) OR gates only
 - (b) NAND gates only
 - (c) EXOR gates only
 - (d) NOT gates only
19. The minimum number of 2-to-1 multiplexers required to realize a 4-to-1 multiplexer is
- (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
20. If $S(f)$ is the power spectral density of a real wide sense stationary random process, then which of the following is **always** true ?
- (a) $S(0) \geq S(f)$
 - (b) $S(f) \geq 0$
 - (c) $S(-f) = -S(f)$
 - (d) None of the above
21. Quadrature multiplexing is
- (a) The same as FDM
 - (b) The same as TDM
 - (c) A combination of FDM and TDM
 - (d) Quite different from FDM and TDM
22. The far field of an antenna varies with distance r as
- (a) $1/r$
 - (b) $1/r^2$
 - (c) $1/r^3$
 - (d) R
23. Intrinsic impedance of free space is given by
- (a) 0Ω
 - (b) 1Ω
 - (c) Infinity

(d) 377Ω

24. Binary number 1101 is equal to octal number

- (a) 17
- (b) 16
- (c) 15
- (d) 14

25. At the unity-gain frequency, the open-loop voltage gain is

- (a) 1
- (b) 0
- (c) 20
- (d) Very large

Section-B

**Answer the following each question carries 2 Marks
15 questions \times 2 marks = 30 Marks**

1. If a signal $f(t)$ has energy E , the energy of the signal $f(2t)$ is equal to
 - (a) E
 - (b) $E/2$
 - (c) $2E$
 - (d) $4E$

2. The Fourier series of an odd periodic function, contains only
 - (a) Odd harmonics
 - (b) Even harmonics
 - (c) Cosine terms
 - (d) Sine terms

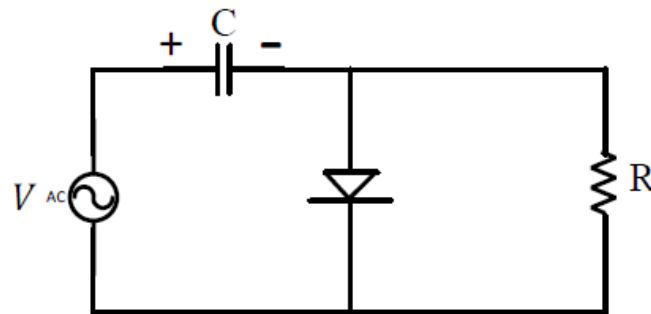
3. MOSFET can be used as a
 - (a) Current controlled capacitor
 - (b) Voltage controlled capacitor
 - (c) Current controlled inductor
 - (d) Voltage controlled inductor

4. An opamp has a voltage gain of 2,00,000. If the output voltage is 1V, the input voltage is
 - (a) $2\mu\text{V}$
 - (b) $5\mu\text{V}$
 - (c) 10V
 - (d) 1V

5. The load voltage is approximately constant when the Zener diode is
 - (a) Forward biased

- (b) Reverse biased
- (c) Operating in the breakdown region
- (d) Unbiased

6. If the circuit shown has to function as a clamping circuit, then which one of the following conditions should be satisfied for the sinusoidal signal of period T ?



- (a) $RC \ll T$
- (b) $RC = 0.35T$
- (c) $RC = T$
- (d) $RC \gg T$

7. The cascade amplifier is a multistage configuration of

- (a) CC-CB
- (b) CE-CB
- (c) CB-CC
- (d) CE-CC

8. The current gain of a Bipolar transistor drops at high frequencies because of

- (a) Transistor capacitances
- (b) High current effects in the base
- (c) Parasitic inductive elements
- (d) The early effect

9. 2's complement of binary number 0101 is

- (a) 1011
- (b) 1111
- (c) 1101
- (d) 1110

10. The Boolean function $Y = AB + CD$ is to be realized using only 2 input NAND gates. The minimum number of gates required is

- (a) 2
- (b) 3
- (c) 4
- (d) 5

11. In a double side-band full carrier AM transmission system, if the modulation index is doubled, then the ratio of total sideband power to the carrier power increases by a factor.
- (a) 2 times
 - (b) 4 times
 - (c) 6 times
 - (d) 8 times
12. White Gaussian noise is passed through a linear narrow band filter. The probability density function of the envelope of the noise at the filter output is
- (a) Uniform
 - (b) Poisson
 - (c) Gaussian
 - (d) Rayleigh
13. If the diameter of a $\lambda/2$ dipole antenna is increased from $\lambda/100$ to $\lambda/50$ then its
- (a) Bandwidth increases
 - (b) Bandwidth decreases
 - (c) Gain increases
 - (d) Gain decreases
14. Some unknown material has a conductivity of 10^6 mho/m and a permeability of $4\pi \times 10^{-7}$ H/m. The skin depth for the material at 1GHz is
- (a) $15.9\mu\text{m}$
 - (b) $25.9\mu\text{m}$
 - (c) $20.9\mu\text{m}$
 - (d) $30.9\mu\text{m}$
15. In a good conductor the phase relation between the tangential components of electric field E_t and the magnetic field H_t is as follows
- (a) E_t and H_t are in phase
 - (b) E_t and H_t are out of phase
 - (c) H_t leads E_t by 90°
 - (d) E_t leads H_t by 45°

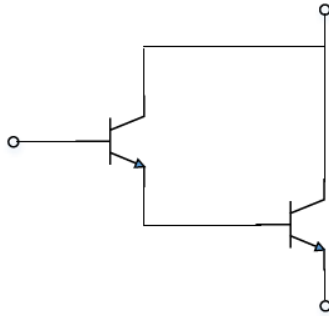
Section- C

**Answer the following each question carries 3 Marks
5 questions \times 3 marks = 15 Marks**

1. The minimum number of 2-input NAND gates required to implement the Boolean function $Z = AB'C$ are
- (a) Two
 - (b) Three
 - (c) Five

(d) Six

2. Each transistor in the Darlington pair has $h_{fe} = 100$. The overall h_{fe} of the composite transistor neglecting the leakage currents is



- (a) 10000
(b) 10001
(c) 10100
(d) 10200
3. For a periodic signal $v(t) = 30\sin 100t + 10\cos 300t + 6\sin(500t + \pi/4)$, the fundamental frequency in rad/s is
(a) 100
(b) 300
(c) 500
(d) 1500
4. Consider sinusoidal modulation in an AM systems. Assuming no over modulation, the modulation index when the maximum and minimum values of the envelope, respectively are 3V and 1V is
(a) 0
(b) 0.5
(c) 0.7
(d) 0.8
5. A uniform plane wave incident normally on a plane surface of a dielectric material is reflected with a VSWR of 3. What is the percentage of incident power that is reflected?
(a) 10%
(b) 25%
(c) 50%
(d) 75%