



Department of Electrical and Electronics 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: Electrical and Electronics Engineering

Syllabus:

Networks: D.C. and A.C. circuits - loop and nodal analysis, source transformation, star-delta transformation, Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer theorems, time response of circuits, complex power, resonance, two port networks, solution of balanced and unbalanced 3- ϕ circuits.

Electrical Measurements: Bridges and potentiometers; indicating instruments - PMMC, moving iron, dynamometer, electrostatic and induction type meters, ammeters and voltmeters, errors in indicating instruments; wattmeter, energy meter and other measuring instruments - measurement of power, energy and power factor and frequency, errors and compensation.

Control Systems: Transfer function, block diagrams, servo and stepper motors, error constants, stability, Routh and Niquist criterion, Bode plots, root loci, lag, lead and lead-lag

compensation, PD, PI & PID controllers, state space model, state transition matrix, controllability and observability.

Electrical Machines: Energy conversion principles; DC machines - types, generator characteristics, armature reaction and commutation, testing and speed control of dc motors; three phase induction motors - principles, types, performance characteristics, starting testing and speed control, single phase induction motors; synchronous machines - performance, regulation and parallel operation of generators, synchronous motor starting, characteristics and applications; single phase transformer - equivalent circuit, phasor diagram, testing, regulation and efficiency; three phase transformers.

Power Systems: Generation of electrical Power; transmission line parameters; sag calculations; insulators and cables; economic operation; symmetrical components and fault analysis; load flow analysis; steady-state and transient stability analysis; load frequency control; circuit breakers and protective relays; basics of HVDC transmission and FACTS; power quality.

Power Electronics and Drives: Semiconductor power diodes and power transistors; thyristors family – SCR, Triac, GTO, MOSFET and IGBTs; SCRs - gate characteristics, static and dynamic characteristics, triggering circuits, phase control rectifiers, choppers, inverters, ac to ac converters; basis concepts and control of dc and ac drives; electrical traction.

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

Model-Question paper

Duration: 2 hours

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: Electrical and Electronics 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) Hay's bridge is suitable for the measurement of which one of the following?
 - a) Inductance with $Q < 10$
 - b) Inductance with $Q > 10$
 - c) Capacitance with high dissipating factors.
 - d) Capacitance with low dissipating factors.

- 2) The transfer function of a system is given as $100/s^2 + 20s + 100$ The system is
 - a) an overdamped system
 - b) an underdamped system
 - c) a critically damped system
 - d) an unstable system

- 3) The transmission line distance protection relay having the property of being inherently directional is
 - a) Impedance relay
 - b) MHO relay
 - c) OHM relay
 - d) Reactance relay

- 4) The number of roots of the equation $2s^4 + s^3 + 3s^2 + 5s + 7 = 0$ that lie in the right half of the s-plane is

a) Zero	c) One
b) Two	d) Three

- 5) A stationary closed Lissajous pattern on an oscilloscope has 3 horizontal tangencies and 2 vertical tangencies, for a horizontal input with frequency 3 KHz. The frequency of the vertical input is (in KHz)
- 1.5
 - 2
 - 3
 - 4.5
- 6) For an induction motor, operating at a slip s , the ratio of gross power output to air gap power is equal to
- $(1-s)^2$
 - $(1-s)$
 - S
 - 1
- 7) Keeping in view the requirement of parallel operation, which of the 3-phase connections given below are possible?
- Delta-delta to delta-star
 - Delta-delta to star-delta
 - Delta-star to delta-star
 - Delta-star to star-delta
- 8) A synchronous generator connected to an infinite bus is over excited. Considering only the reactive power, from the point of the system the machine acts as
- A capacitor
 - An inductor
 - A resistor
 - None
- 9) Which type of motor is most suitable for computer printer drive?
- Reluctance motor
 - Hysteresis motor
 - Shaded pole motor
 - Stepper motor
- 10) Keeping in view the cost and overall effectiveness, the following circuit breaker is best suited for capacitor bank switching
- Vacuum
 - Air blast
 - SF_6
 - Oil
- 11) The rated voltage of a 3-phase power system is given as
- Rms phase voltage
 - Peak phase voltage
 - Rms line to line voltage
 - Peak line to line voltage

- 12) Series capacitive compensation in EHV transmission lines is used to
- Reduce the line loading
 - Improve the stability of the system
 - Reduce the voltage profile
 - Improve the protection of the line
- 13) Corona losses are minimized when
- Conductor size is reduced
 - Smoothness of conductor is reduced
 - Sharp points are provided in the line hardware
 - Current density in conductors is reduced
- 14) In a 3-phase controlled bridge rectifier, with an increase of overlap angle the output dc voltage
- Decreases
 - Increases
 - Does not change
 - Depends upon load inductance
- 15) The typical ratio of latching current to holding current in a 20 thyristor is
- 5
 - 2
 - 1
 - 0.5
- 16) The MOSFET switch in its ON state may be considered equivalent to
- Resistor
 - Inductor
 - Capacitor
 - Battery
- 17) Signal flow graph is used to obtain the
- Stability of a system
 - Transfer function of a system
 - Controllability of a system
 - Observability of a system
- 18) For a feedback control system of type 2, the steady state error for a ramp input is
- Infinite
 - Constant
 - Zero
 - Indeterminate

- 19) Introduction of integral action in the forward path of a unity feedback system results in
- Marginally stability
 - System with no steady state error
 - System with increased stability margin
 - System with better speed of response
- 20) An advantage of permanent magnet moving coil instrument is that is
- Free from friction error
 - Has high torque/weight ratio
 - Has low torque/weight ratio
 - Can be used on both ac and dc
- 21) A Kelvin double bridge is best suited for the measurement of
- Inductance
 - Capacitance
 - Low resistance
 - High resistance
- 22) The number of independent KVL and KCL equations for a network with N-nodes and L-links are respectively
- L and N
 - L and N-1
 - N-1 and L
 - N-1 and L-1
- 23) Superposition theorem is not applicable for
- Voltage calculation
 - Bilateral elements
 - Power calculations
 - Passive elements
- 24) When a source is delivering maximum power to a load, the efficiency of the circuit is always
- 50%
 - 75%
 - 100%
 - Depends on the circuit parameters
- 25) At resonant frequency a R-L-C series circuit draws maximum current due to the reason that
- The difference between capacitive reactance and inductive reactance is zero
 - The impedance is more than resistance
 - The voltage across the capacitor equals the applied voltage
 - The power factor is less than unity

Section-B
Answer the following each question carries 2 Marks
15 questions × 2 marks= 30 Marks

- 1 A 8 pole, DC generator has a simplex wave wound armature containing 32 coils of 6 turns each. It's flux per pole is 0.06 wb. The machine is running at 250 rpm. The induced armature voltage is
 - a) 96 V
 - b) 192 V
 - c) 384 V
 - d) 768 V

- 2 A single-phase diode bridge rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The ac supply side current waveform will be
 - a) Sinusoidal
 - b) Constant dc
 - c) Square
 - d) Triangular

- 3 A 300 KVA transformer has 95% efficiency at full load 0.8 p.f lagging and 96% efficiency at half load unity p.f. What is the maximum efficiency (in %) at unity p.f .load?
 - a) 95.1
 - b) 96.2
 - c) 98.4
 - d) 98.1

- 4 A single phase 2 KVA, 100/200 V transformer is reconnected as an auto transformer such that it's KVA rating is maximum. The new rating in KVA, is
 - a) 6
 - b) 4
 - c) 8
 - d) 16

- 5 A synchronous motor operates at 0.8 p.f lag. If the field current of the motor is continuously increased
 - P: The power factor decreases up to certain value of field current and there after it increases.
 - Q: The armature current increases up to a certain value of field current and there after it decreases.
 - R: The power factor increases up to certain value of field current and there after it decreases.
 - S: The armature current decreases up to a certain value of field current and there after it increases.

From these the correct one is

- a) P and Q
- b) Q and R
- c) R and S
- d) P and R

- 6 A three-phase squirrel cage induction motor has a starting torque of 150% and a maximum torque of 300% with respect to rated torque at rated voltage and rated frequency. Neglect the stator resistance and rotational losses, the value of slip for maximum torque is
- a) 13.48%
 - b) 16.42%
 - c) 18.92%
 - d) 26.79%

7. The frequency response of a linear system $G(j\omega)$ is provided in the tabular form below:

Magnitude	1.3	1.2	1.0	0.8	0.5	0.3
Phase angle (degrees)	-130	-140	-150	-160	-180	-200

The gain margin and phase margin of the system are

- a) 6 dB and 30°
 - b) 6 dB and -30°
 - c) -6 dB and 30°
 - d) -6 dB and -30°
- 8 The transfer function of a lead compensator is given as $G_c(s) = (s+1)/(s+2)$. The phase of the lead compensator is maximum at (in rad/sec)
- a) 1.414
 - b) 1.732
 - c) 2.45
 - d) 0.577
- 9 A DC ammeter has a resistance of 0.1Ω and its current range is 0-100 A. If the range is to be extended to 0-500 A, then meter requires the following shunt resistance
- a) 0.010
 - b) 0.011
 - c) 0.025
 - d) 1.0
- 10 Two wattmeters', which are connected to measure the total power on a three-phase system supplying a balanced load, read 10.5 KW and -2.5 KW, respectively. The total power and power factor respectively are

- a) 13 KW, 0.334
- b) 13 KW, 0.684
- c) 8 KW, 0.52
- d) 8 KW, 0.334

11 The incremental cost characteristics of two generators delivering 200 MW are as follows:

$$IC_1=20+0.1P_1$$

$$IC_2=16+0.2P_2$$

For economic operation, the generation P_1 and P_2 should be

- a) $P_1=P_2=100$ MW
 - b) $P_1=80$ MW, $P_2=120$ MW
 - c) $P_1=200$ MW, $P_2=0$ MW
 - d) $P_1=120$ MW, $P_2=80$ MW.
- 12 The severity of line-to-ground and 3-phase faults at the terminals of an unloaded synchronous generator is to be same. If the terminal voltage is 1.0 p.u. and $X_1=X_2=j0.1$ p.u. $X_0=j0.05$ p.u. for the alternator, then the required inductive reactance for neutral ground is
- a) 0.0166 p.u
 - b) 0.05 p.u
 - c) 0.1 p.u
 - d) 0.15 p.u

13 A 400 KV transmission line is having per phase line inductance of 1.1 mH/km and per phase line capacitance of 11.68 nF/km. Ignoring the length of the line, it's ideal power transfer capability in MW is

- a) 1042
- b) 521
- c) 2084
- d) 2840

14 A power system consists of 250 buses out of which 22 buses are generator buses, 15 buses are ones with reactive power support and 10 buses are the ones with fixed shunt capacitors. All the other buses are load buses. It is proposed to perform a load flow analysis in the system using Newton-Raphson method. The size of the Jacobian matrix is

- a) 462X462
- b) 453X453
- c) 451X451
- d) 464X464

15 A step-up chopper is used to feed a load at 400 V dc from a 250 V dc source. The inductor current is continuous. If the off time of the switch is $20\mu\text{s}$, the switching frequency of the chopper in KHz is

- a) 62.4

- b) 15.6
- c) 31.2
- d) 124.8

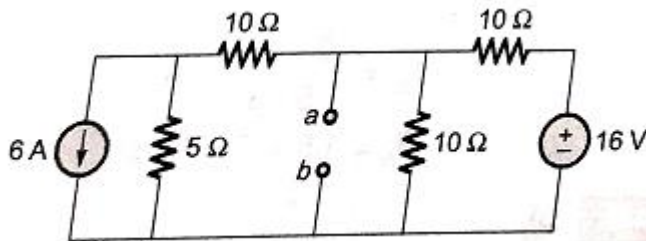
Section- C

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

- 1 A single-phase full bridge VSI is fed from a 300 V battery. A pulse of 120° duration is used to trigger the appropriate device in each half cycle. The rms value of the fundamental component of the output voltage, in volts is
 - a) 234
 - b) 245
 - c) 300
 - d) 331

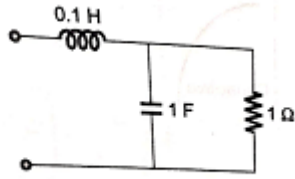
- 2 A single-phase half-controlled rectifier is driving a separately excited dc motor. The dc motor has a back emf constant of 0.25 V/rpm. The armature current is 5 A without any ripple. The armature resistance is 2Ω . The converter is working from a 230 V, single phase ac source with a firing angle of 30° . Under this operating condition, the speed of the motor will be
 - a) 346 rpm
 - b) 359 rpm
 - c) 366 rpm
 - d) 386 rpm

- 3 For the network given in figure below, the Thevenin's voltage V_{ab} is



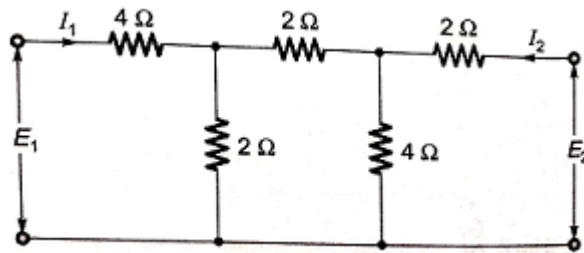
- a) -1.5 V
- b) -0.5 V
- c) 0.5 V
- d) 1.5V

4 The resonant frequency for the given circuit will be



- a) 1 rad/sec
- b) 2 rad/sec
- c) 3 rad/sec
- d) 4 rad/sec

5 For the two-port network shown in figure, the value of h_{12} is given by



- a) 0.125
- b) 0.167
- c) 0.625
- d) 0.25