Entrance Test for Enrollment in Ph.D. Programme
July 2017

Time: 120 Mins. **Max. Marks: 120**

Stream : **Engineering** Discipline : **Electrical Engineering** Set : **A** Test ID : 21

Name :

Father's Name :

Roll Number : | | | | | | | | | | ***Date :*** | | | | | | | | |

Roll Number in words :

Signature of Candidate :

Signature of Invigilator :

IMPORTANT INSTRUCTIONS

- Do not Open seal before start of Exam.
- Fill all the information in various columns in capital letters, with blue/black ball point pen.
- Use of calculators is not allowed.
- All questions are compulsory. No negative marking for wrong answers.
- Each question has only right answer.
- Questions attempted with two or more options/answers will not be evaluated.
- Kindly bring any one of the original photo-identity proofs at the time of entrance test, like Voter ID Card, Driving License, PAN Card or Passport along with **ADMIT CARD.**
- Study the instructions carefully before the start of examination.
- The time duration for the test will be 120 minutes.
- You must report at examination centre 30 minutes prior to examination.
- Test will comprise of two sections. The Section-I will comprise of Research Methodology and section-II will be Subject specific. Each Section will comprise of 60 questions carrying each making total paper of 120 marks.
- **It will be compulsory for the candidate to secure minimum passing marks in each section (which amounts to be 50% i.e. 30 marks for the general category and 45% i.e. 27 for reserved categories in each section).** The passing marks will be 50% of the total i.e. 60 marks for general category and 45% for reserved categories i.e. 54 marks.
- The questions paper will comprise of Multiple Choice Questions.
- Each question will have only one right answer.
- Blank, Cutting, Erasing, Half filling or Question attempted with two or more answers will not be evaluated
- There is no negative marking for wrong answers.
- OMR sheet should not be folded or crushed.
- Use only **BLACK BALL POINT PEN** to fill the ovals.
- Use of pencil is strictly prohibited.
- Ovals on **OMR sheet** should be darkened completely and properly filled.
- Cutting and erasing on **OMR sheet** is not allowed.
- Do not use any stray marks on the **OMR sheet.**
- Do not use marker or white fluid to hide the marks.
- Fill **ROLL NUMBER** and **TEST ID** carefully on the **OMR sheet.**
- Use of calculator is not allowed.
- Log tables may be provided for calculation work, if required.
- The medium of the examination is English only.
- No sheet will be provided for the rough work. Reverse side of the question paper can only be used for rough work.
- **Carrying mobile phones, electronic gadgets, notes or extra papers in examination hall is not allowed.**

Research Methodology

Section -I

1. Which of the following is the best way to test a hypothesis according to the hypothetico-deductive method?
    a. By finding evidence which supports the hypothesis.
    b. By repeating a study looking for consistency in outcomes.
    c. By rejecting the hypothesis.
    d. By looking for instances where the hypothesis fails.
2. Which of the following are the most similar?
    a. Ordinal, interval and ratio data
    b. Nominal, ratio, and interval data
    c. Nominal and ratio data
    d. Nominal, ordinal and ratio data
3. What sort of variable is dress size?
    a. Ordinal
    b. Ratio
    c. Nominal
    d. Dependent
4. What is deemed a good measure of the quality of a journal?
    a. The intake factor.
    b. The impact factor.
    c. The OPAC factor.
    d. The influence factor.
5. Variables in a cross-sectional design are:
    a. nominal data.
    b. a mixture of both score and nominal data.
    c. frequencies.
    d. score data
6. Studies which measure the same variables in the same cases over time are called:
    a. lagged.
    b. panel.
    c. cross-lagged.
    d. synchronous.
7. Response rate refers to:
    a. how confident you want to be about your results.
    b. how variable participants' responses are.
    c. the proportion of people who take part in a study.
    d. how big a population is.
8. The difference between the mean of a researcher's sample and the mean of the population of the sample is known as the:
    a. sampling error.
    b. significance level.
    c. confidence interval.
    d. standard deviation.
9. The purpose of research is:
    a. to extend the conceptual understanding of a topic.

b. that the empirical work should be testing a theory.
c. primarily to get more data.
d. to produce work of publishable quality.

10. 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
11. Questionnaire is a
    a. Research method
    b. Measurement technique
    c. Tool for data collection
    d. Data analysis technique
12. Which of the following is not covered under Intellectual Property Rights ?
    a. Copyrights
    b. Patents
    c. Trade Marks
    d. Thesaurus
13. Field study is related to
    a. real life situations
    b. experimental situations
    c. laboratory situations
    d. none of the above
14. Which of the following is a non-probability sample ?
    a. Quota sample
    b. Simple random sample
    c. Purposive sample
    d. (a) and (c) both
15. Formulation of hypothesis may not be necessary in
    a. survey studies
    b. fact finding (historical) studies
    c. normative studies
    d. experimental studies
16. All are causes of non sampling errors except
    a. faulty tools of measurement
    b. inadequate sample
    c. non response
    d. defect in data collection
17. The review of the related study is important while undertaking a research because
    a. it avoids repetition or duplication
    b. it helps in understanding the gaps
    c. it helps the researcher not to draw illogical conclusions
    d. all of above
18. Of all of the steps in the research process, the one that typically takes the most time is
    a. selecting a research method.
    b. developing a hypothesis.
    c. data collection.
    d. formulating the problem.

19. A mean, median and mode are all examples of _____
    a. measures of correlation
    b. measures of enumeration
    c. measures of coefficients
    d. measures of central tendency
20. Research carried out to portray accurately the characteristics of a particular individual, situation or a group are termed as
    a. Exploratory
    b. Descriptive
    c. Diagnostic
    d. None of these
21. A _____ is conducted to detect weaknesses in research instrument's design
    a. Pilot study
    b. Questionnaire
    c. Interview
    d. Sampling
22. One of the important characteristics of a good research is that the purpose of the research is
    a. Clearly defined
    b. Vaguely defined
    c. Not defined
    d. All of the above
23. In order to deliver a good research, a researcher should confine the conclusions to those justified by
    a. The Data
    b. The Perception of Researcher
    c. The Intuition
    d. The Guide
24. The research plan should include
    a. Research objective
    b. Research Methods
    c. Sampling Plan
    d. All of these
25. Which of the following are excellent sources for research topics?
    a. Theory
    b. Personal experience
    c. Replication of prior research
    d. All of the above
26. A review of the literature should enable an investigator to do which of the following?
    a. Ascertain what is already known about a topic.
    b. Identify methodological strategies for designing the study.
    c. Provide the insight necessary to develop a logical framework into which the topic fits.
    d. All of the above.
27. The Internet has become an accepted source of information for educational research. Which of the following is NOT an indicator of the quality of information found on the Internet?
    a. The number of "hits" for the site
    b. The honesty with which information is reported and presented
    c. The authenticity of the information
    d. The lack of bias
28. A literature review should be characterized by all of the following EXCEPT

a. summarize and report each article.
b. use important topics as the organizing structure of the review.
c. analyze all articles for similarities and differences related to major topics.
d. discuss implications relative to the research problem.

29. Which of the following is the BEST hypothesis?
    a. Students taking formative quizzes will perform better on chapter exams than students not taking these quizzes.
    b. Taller students will have higher test scores than shorter students.
    c. Students taught in a cooperative group setting should do better than students in a traditional class.
    d. Students using laptops will do well.
30. Which of the following statistics is most closely related to the standard error of the mean?
    a. Mean
    b. Standard deviation
    c. Z score
    d. Correlation
31. A significant result of a chi square test of significance would suggest the researcher should
    a. accept the null hypothesis.
    b. reject the null hypothesis.
    c. reject the alternative hypothesis.
    d. replicate the study.
32. Ram has set a very conservative alpha level of .001 for his analysis. He is likely concerned about a
    a. Type I error.
    b. Type II error.
    c. standard error.
    d. test of significance.
33. Mr. Sham has identified two groups of students to participate in his study examining the effectiveness of using algebra tiles. One group will use these manipulatives while a second group will receive a traditional lecture approach. Which test should be used to test the differences between the mean scores for the two classes?
    a. t test for dependent samples
    b. t test for independent samples
    c. Chi square
    d. Scheffé post hoc comparison
34. Which of the following is a common post hoc test?
    a. Scheffé
    b. Tukey HSD
    c. Duncan's Multiple Range Test
    d. All of the above
35. Ms. Rani is making decisions to accept students into her college based on a prediction of a student's future performance derived from his or her high school GPA, ACT score, and college placement test score. Which statistical procedure did she use to develop this predictive process?
    a. ANOVA
    b. ANCOVA
    c. Multiple regression
    d. Chi square
36. Which section of a research report sets the stage for the report and indicates where in the report each component, tables, and figures can be found?
    a. Preliminary pages

b. Table of contents
c. Main body
d. Appendices

37. In which section is the researcher allowed greater flexibility to express opinions, discuss implications for educational practice, and suggest additional research?
    a. Review of the literature
    b. Significance of the study
    c. Results
    d. Discussion
38. An unhypothesized result represents a(n)
    a. accepted null hypothesis.
    b. rejected null hypothesis.
    c. unintended result that appeared in the study.
    d. statistical error.
39. The purpose of random sampling is to ensure
    a. a sufficient sample size.
    b. a clearly defined target population.
    c. representativeness of the sample.
    d. representation of specific subgroups in the population.
40. Which of the following is NOT a random sampling technique?
    a. Purposive sampling
    b. Stratified sampling
    c. Cluster sampling
    d. Systematic sampling
41. The logic of purposive sampling is
    a. that a random sample can generalize to a population.
    b. that a few information-rich participants studied in depth yield many insights about a topic.
    c. to include all participants, even though they are not all relevant to the problem.
    d. to use participants because the researcher has access to them.
42. Which of the following is a characteristic of a standardized test?
    a. The administration of the test is controlled carefully to ensure that all examinees experience the same conditions.
    b. The test is developed by experts to ensure it is technically sound.
    c. The scores are interpreted in standard ways.
    d. All of the above.
43. Which of the following is a characteristic of qualitative research?
    a. It relies on disciplined inquiry.
    b. It uses random sampling techniques.
    c. It uses a static, fixed research design.
    d. It is deductive in orientation
44. Memo writing helps accomplish all of the following EXCEPT
    a. identify topics or issues for further exploration.
    b. select appropriate participants.
    c. identify areas that could provide focus for the formal data analysis.
    d. provide opportunities to reflect on methodology.
45. Which of the following represents excellent advice for conducting an interview?
    a. Listen more and talk less.
    b. Don't interrupt.

c. Don't be judgmental about the interviewee's beliefs or views.
d. All of the above.

46. Which of the following types of items is likely to result in the most objective score?
    a. Open-ended
    b. Short answer
    c. Multiple choice
    d. Essay
47. Measures of variability indicate
    a. the average score.
    b. the central tendency of scores.
    c. the extent to which scores differ from one another.
    d. the relationships between variables.
48. Approximately what percentage of scores in a normal distribution fall between +1 and -1 standard deviations?
    a. 50
    b. 68
    c. 75
    d. 99
49. Mr. Ram has ranked the students in his class on the basis of their math scores. He wants to compare these ranks with the ranks of the same students in Ms.Rani's English class. Which correlation coefficient is appropriate for Mr. Ram to use?
    a. Pearson r
    b. Spearman rho
    c. Mean
    d. Quartile deviation
50. Primary data which is gathered by observing relevant actions and people is called
    a. experimental research
    b. ethnographic research
    c. observational research
    d. survey research
51. Idea generation by two or more people thinking as freely as possible is formally known as:
    a. brainstorming.
    b. the learning curve.
    c. forced relationships.
    d. clap-trapping.
52. Which ONE of these is an example of processed data?
    a. Number of visitors to a store.
    b. Tables from surveys.
    c. Customer comments.
    d. CCTV recordings of shopper visits.
53. Which ONE is an advantage of secondary data?
    a. May be outdated.
    b. May not be accurate.
    c. Expensive.
    d. Already exist.
54. With efficient IPR system, India becomes prosperous in terms of "Knowledge Economy", which is a boon towards the goal of VISION-____?
    a. 2020

b. 2030
c. 2040
d. 2050

55. The copyrights does not include rights in form of
    a. news-paper items,
    b. land ownership
    c. story books,
    d. poetry books,
56. In India, Patent rights are governed by
    a. Patent Act, 1970
    b. Patent Act, 1980
    c. Patent Act, 1990
    d. Patent Act, 1950
57. A mark shall not be registered as a trade mark if
    a. It is of such nature as to deceive the public or cause confusion:
    b. It contains or comprises of any matter likely to hurt the religious susceptibilities of any class or section of the citizens of India;
    c. It comprises or contains scandalous or obscene matter
    d. All of these
58. Computer programmes are protected under the
    a. Copyright Act
    b. Trademark Act
    c. Patent Act
    d. All of these
59. The general rule is that copyright lasts for
    a. 45 Years
    b. 50 Years
    c. 55 Years
    d. 60 Years
60. The existing legislation on industrial designs in India is contained in the New
    a. Designs Act, 2000
    b. Designs Act, 2009
    c. Designs Act, 1995
    d. Designs Act, 2015

Section - II Electrical Engineering

61 A Laplace Transform exists when _____
1) the function is piece-wise continuous
2) the function is of exponential order
3) the function is piecewise discrete
4) the function is of differential order
(A) 1 & 2
(B) 3 & 4
(C) 1 & 4
(D) 2 & 3

62 What is the derivative of f(x) = | x | at x = 0
(A) 1
(B) -1
(C) 0
(D) does not exist

63 Causal systems are the systems in which
(A) the output of the system depends on the present and the past inputs
(B) the output of the system depends only on the present inputs
(C) the output of the system depends only on the past inputs
(D) the output of the system depends on the present input as well as the previous outputs

64 There are four bus lines between A and B; and three bus lines between Band C. The number of way a person roundtrip by bus from A to C by way of B will be
(A) 12
(B) 48
(C) 144
(D) 264

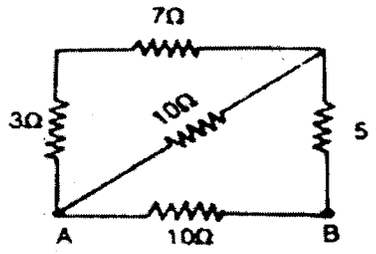
65 In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?
(A) 1/3
(B) 3/4
(C) 7/19
(D) 8/21

66 Given that y(x) is the solution to $\frac{dy}{dx} = y^3 + 2$, y(0) = 3 the value of y(0.2) from a second order Taylor polynomial around x=0 is
(A) 4.400
(B) 8.800
(C) 24.46
(D) 29.00

67 Kirchhoff's second law is based on law of conservation of
(A) charge
(B) energy
(C) momentum
(D) mass

68 The superposition theorem is applicable to
(A) current only
(B) voltage
(C) both current and voltage
(D) current, voltage and power

69 Five resistances are connected as shown in figure below. The equivalent resistance between the points A and B will be



(A) 35 ohms
(B) 25 ohms
(C) 15 ohms
(D) 5 ohms

70 An ideal voltage source
(A) has terminal voltage in proportion to current
(B) has terminal voltage in proportional to load
(C) has zero internal resistance
(D) has open circuit voltage nearly equal to the voltage on full load

71 When a source is delivering maximum power to a load, the efficiency of the circuit
(A) is always 50 %
(B) depends on the circuit parameters
(C) is always 75 %
(D) is always 25 %

72 The magneto-motive force is
(A) the voltage across the two ends of exciting coil
(B) the flow of an electric current
(C) the sum of all currents embraced by one line of magnetic field
(D) the passage of magnetic field through an exciting coil

73 For which of the following materials the net magnetic moment should be zero ?
(A) diamagnetic materials
(B) ferrimagnetic materials
(C) anti-ferromagnetic materials
(D) anti-ferrimagnetic materials

74 In a magnetic material hysteresis loss takes place primarily due to
(A) rapid reversals of its magnetisation
(B) flux density lagging behind magnetising force
(C) molecular friction
(D) it high retentivity

75 Which of the following is not a vector?
(A) linear momentum
(B) angular momentum
(C) electric field
(D) electric potential

76 "The total electric flux through any closed surface surrounding charges is equal to the amount of charge enclosed". This statement is associated with
(A) Coulomb's square law
(B) Gauss's law
(C) Maxwell's first law
(D) Maxwell's second law

77 The Biot-savart's law is a general modification of
(A) Kirchhoffs law
(B) Lenz's law
(C) Ampere's law
(D) Faraday's laws

78 Which of the following inductor will have the least eddy current losses?
(A) air core
(B) laminated iron core
(C) iron core
(D) powdered iron core

79 The core used in high frequency transformer is usually
(A) copper core
(B) cast iron core
(C) air core
(D) mild steel core

80 An open-circuit test on a transformer is conducted primarily to measure
(A) insulation resistance
(B) copper loss
(C) core loss
(D) efficiency

81 Iron losses in a D.C. machine are independent of variations in
(A) speed
(B) load
(C) voltage
(D) speed and voltage

82 Wave wound 8 pole DC motor has 360 conductors. Number of parallel path between the conductors are
(A) 2
(B) 4
(C) 6
(D) 8

83 Which of the following DC motor is never allowed to run at No-Load condition?
(A) shunt
(B) series
(C) compound
(D) separately excited

84 A 3-phase 440 V, 50 Hz induction motor has 4% slip. The frequency of rotor e.m.f. will be
(A) 200Hz
(B) 20Hz
(C) 2Hz
(D) 0.2 Hz

85 Change of 4% of supply voltage to induction motor will produce a change of _____ % in rotor torque
(A) 4
(B) 8
(C) 12
(D) 16

86 A synchronous machine
(A) can operate at unity pf
(B) can operate at leading pf
(C) can operate at lagging pf
(D) can operate at any pf

87 India's first Nuclear Power Plant was installed at
(A) Kota
(B) Tarapore
(C) Kalpakkam
(D) Durgapur

88 Out of following which one is over-current relay?
(A) IDMT
(B) Buchlotz
(C) Mho
(D) Differential

89 Plug setting of a relay can be altered by varying
(A) air gap of magnetic path
(B) no. of ampere-turns
(C) adjustable back up stop
(D) all of these

90 In which of the following given faults, all the sequence currents are equal?
(A) line to ground
(B) double line to ground
(C) 3-phase
(D) line to line

91 In a 3-phase, 5 kV, 5 MVA system, what is the base impedance?
(A) 5 ohm
(B) 500 ohms
(C) 0.5 ohm
(D) 50 ohms

92 Making and breaking currents of 3 phase AC circuit breakers in power system are respectively in what form?
(A) RMS and RMS value
(B) Instantaneous and RMS value
(C) RMS and Instantaneous value
(D) Any of the above

93 In closed loop control system, with positive value of feedback gain the overall gain of the system will
(A) decrease
(B) increase
(C) be unaffected
(D) any of the above

94 Which of the following statements is correct for a system with gain margin close to unity or a phase margin close to zero?
(A) the system is relatively stable
(B) the system is highly stable
(C) the system is highly oscillatory
(D) the system is marginally stable

95 The transfer function is applicable to which of the following?
(A) linear and time-in variant systems
(B) linear and time-variant systems
(C) linear systems
(D) non-linear systems

96 Phase margin of a system is used to specify which of the following?
(A) frequency response
(B) absolute stability
(C) relative stability
(D) time response

97 Control systems are normally designed with damping factor
(A) less than unity
(B) more than unity
(C) zero
(D) unity

98 In Routh Hurwitz Criterion if there are changes of signs in the elements of the first column then the number of sign changes indicates
(A) the number of roots with negative real parts
(B) the number of roots with positive real parts
(C) the number of pair of roots of opposite sign
(D) the number of pair of roots of same sign

99 If the gain of the open loop system is doubled the gain margin
(A) is not affected
(B) gets doubled
(C) becomes half
(D) becomes one fourth

100 The sweep generator of a CRO is used to produce
(A) sinusoidal voltage for the horizontal deflection of electron beam
(B) saw tooth voltage for the vertical deflection of electron beam
(C) sinusoidal voltage for the vertical deflection of electron beam
(D) saw tooth voltage for the horizontal deflection of electron beam

101 The resistances of potential transformer winding is minimized by using
(A) thick conductors and small length of turns
(B) thin conductors and small length of turns
(C) thin conductors and large length of turns
(D) thick conductors and large length of turns

102The Maxwell's Inductance-Capacitance bridge is not suitable for the measurement inductance of coil if the Q factor is

(A) less than 1

(B) between 1 to 10

(C) more than 10

(D) both A and C

103Which of the following transistor configuration is much less temperature dependent?

(A) common base

(B) common emitter

(C) common collector

(D) none of the above

104The input offset current in operational amplifier equals the

(A) difference between the two base currents

(B) average of the two base currents

(C) collector current divided by current gain

(D) difference between the two base-emitter voltages

105A 741 C has

(A) a voltage gain of 100,000

(B) an input impedance of 2 MΩ

(C) an output impedance of 75 Ω

(D) all of the above

106The register in the 8085A that is used to keep track of the memory address of the next op-code to be run in the program is the

(A) stack pointer

(B) program counter

(C) instruction pointer

(D) accumulator

107Convert the hexadecimal number 16 to decimal

(A) 10

(B) 22

(C) 32

(D) 100

108Inverse Fourier transform of sgn (ω) is

(A) $\frac{j}{\pi t}$

(B) 1

(C) U(t)

(D) $\frac{2}{jt}$

109Inverse Laplace transform of $\frac{2s+5}{s^2+5s+6}$ is

(A) 2 exp (-2.5t) cosh (0.5t)

(B) exp (-2t) + exp (-3t)

(C) 2 exp (-2.5t) sinh (0.5t)

(D) 2 exp (-2.5t) cos (0.5t)

110What is the nature of the following function: y[n] = y[n-1] + x[n]?

(A) Integrator

(B) Differentiator

(C) Subtractor
(D) Accumulator

111 What is the period of the sinusoidal signal $x(n) = 5 \cos [0.2\pi]$?
(A) 10
(B) 5
(C) 2
(D) 1

112 The trignometric Fourier series of an even function of time does not have
(A) dc term
(B) cosine term
(C) sine term
(D) odd harmonic terms

113 A conducting SCR can be opened by reducing _____ to zero.
(A) supply voltage
(B) gate voltage
(C) gate current
(D) anode current

114 A Gate-turn-off thyristor
(A) requires a special turn-off circuit like a thyristor
(B) can be turned-off by removing the gate-pulse
(C) can be turned-off by a negative current pulse at the gate
(D) can be turned-off by a positive current pulse at the gate

115 The on-state voltage drop across the IGBT is
(A) less than that across the MOSFET
(B) greater than that across the MOSFET
(C) equal to that of MOSFET
(D) zero

116 In a 3-phase full-converter, the output voltage is at a frequency equal to
(A) supply frequency f
(B) 2f
(C) 3f
(D) 6f

117 The single pulse modulation of PWM inverters, 3rd harmonic can be eliminated if pulse width is equal to
(A) 30^0
(B) 60^0
(C) 120^0
(D) 180^0

118 A voltage source inverter is normally employed when
(A) source inductance is large and load inductance is small
(B) source inductance is small and load inductance is small
(C) both source and load inductance are small
(D) both source and load inductances are large

119 Input impedance of MOSSFET is
(A) less than that of FET but more than BJT
(B) more than that of FET and BJT
(C) more than that of FET but less than BJT
(D) less than that of FET and BJT

120If the line frequency is 50 Hz, the output frequency of bridge rectifier is

(A) 25 Hz

(B) 50 Hz

(C) 100 Hz

(D) 200 Hz