

Entrance Test for Ph.D. Programme-2018

Time: 120 Minutes

Max Marks: 100

Discipline: Mechanical Engineering

Set: A

Test ID: 29

Name:

Father Name:

Roll Number: **Date:**/...../.....

Roll Number in words:

Signature of Candidate:

Signature of Invigilator:

INSTRUCTIONS FOR CANDIDATES

1. Do not open seal before start of Exam.
2. Carefully fill all your details in top portion of this question paper. Don't leave any column blank.
3. Use blue/black ball point pen to fill details on question paper. Write only in capital letters.
4. Carefully fill all your details in top portion of OMR answer sheet. Also put your signatures at bottom portion of OMR.
5. **Use only black ball point pen to fill details & darken circles on OMR sheet. Using pencil is strictly prohibited.**
6. **Carefully fill your Roll No, Test ID, Category, Paper Set and other required details on the OMR sheet.**
7. Question paper consists of two sections. Section-I is of Research Methodology and Section-II is Subject specific. Each section contains 50 multiple choice questions. Total 100 questions of one mark each.
8. **Maximum marks are 100.**
9. **Time allowed is 120 minutes.**
10. **Qualifying marks shall be 50% for General Category and 45% for Reserved Categories.**
11. All questions are compulsory. No negative marking for wrong answers.
12. There are four alternative answers for each question out of which only one is correct.
13. You have to darken the circle of right answer on OMR answer sheet.
14. Questions left blank or attempted with two or more options/answers will not be evaluated.
15. Also read carefully the instructions on OMR answer sheet before attempting the questions.
16. Use of calculator is not allowed.
17. Log tables may be provided for calculation work, if required.
18. OMR sheet should not be folded or crushed. Don't put any stray marks on the sheet.
19. Circles on **OMR sheet** should be darkened completely. Incomplete/half filled circles will not be evaluated.
20. Do not use marker or white fluid on the OMR sheet.
21. **The medium of the examination is English only.**
22. No extra sheet will be provided for the rough work. Use the space inside the question paper pages for rough work.
23. Carrying mobile phones, electronic gadgets, notes or extra papers in examination hall is strictly prohibited.
24. Indulging in any form of unfair means, canvassing, impersonation or misbehaviour with examination staff will result in disqualification of your candidature.

Section-I
Research Methodology

1. Who authored the book "Methods in Social Research"?
 - A) Wilkinson
 - B) C R Kothari
 - C) Kerlinger
 - D) Goode and Halt
2. Social Science deals with
 - A) Objects
 - B) Human beings
 - C) Living things
 - D) Non-living things
3. "The Romance of Research" is authored by
 - A) Redmen and Mory
 - B) P. V. Young
 - C) Robert C. Meir
 - D) Harold Dazier
4. Which of the following is an example of primary data?
 - A) Book
 - B) Journal
 - C) Newspaper
 - D) Census Report
5. ICSSR stands for
 - A) Indian Council for Survey and Research
 - B) Indian Council for Strategic Research
 - C) Indian Council for Social Science Research
 - D) Inter National Council for Social Science Research

6. JRF stands for
- A) Junior Research Functions
 - B) Junior Research Fellowship
 - C) Junior Fellowship
 - D) None of the above
7. In the formulation of problem, which of the following we need to give?
- A) Title
 - B) Index
 - C) Bibliography
 - D) Concepts
8. Analogies are sources of
- A) Data
 - B) Concept
 - C) Research
 - D) Hypothesis
9. When a hypothesis is stated negatively, it is called
- A) Relational Hypothesis
 - B) Situational Hypothesis
 - C) Null Hypothesis
 - D) Casual Hypothesis
10. In a survey, there is an enumerator and
- A) Guide
 - B) Respondent
 - C) Supervisor
 - D) Messenger
11. A short summary of Technical Paper is called
- A) Article
 - B) Research Abstract

C) Publication

D) Guide

12. Ph.D. stands for

A) Doctor of Philosophy

B) Degree in Philosophy

C) Doctor of Psychology

D) None of the above

13. Failure to acknowledge the borrowed material; is called (Take and use of others as one's own)

A) Acknowledgement

B) Foot Notes

C) Index

D) Plagiarism

14. Data related to the Human beings are called

A) Territorial data

B) Organisational data

C) Peripheral data

D) Demographic data

15. Schedule is filled by which of the following?

A) Respondent

B) Enumerator

C) Everybody

D) None of the above

16. Questions in which only two alternatives are possible are called

A) Multiple choice questions

B) Dichotomous Questions

C) Open ended questions

D) Structured questions

17. Assigning numerals or other symbols to the categories or response is called
- A) Editing
 - B) Coding
 - C) Transcription
 - D) Tabulation
18. Tippet table refers to
- A) Table of random digits
 - B) Table used in sampling methods
 - C) Table used in statistical investigations
 - D) All of the above
19. Research and development become the index of development of country. Which of the following reasons are true with regards to the statement?
- A) Because R&D reflect the true economic and social conditions prevailing in a country.
 - B) Because R&D targets the human development.
 - C) Because R&D can improve the standard of living of the people in a country.
 - D) All of the above.
20. The word "Anusandhan" implies
- A) Attaining an aim
 - B) Goal orientation
 - C) Following an aim
 - D) Praying to achieve an aim
21. A Researcher wants to study the relationship of family size to income. He classifies his population into different income slabs and then takes a random sample from each slab in order. Which technique of sampling is he working with?
- A) Cluster sampling
 - B) Random sampling

C) Stratified Random sampling

D) Systematic sampling

For Q. 22-23. The following table gives the sales of batteries manufactured by a company over the years.

Number of different batteries sold (in thousands)

Year	Types of Batteries					
	4AH	7AH	32AH	35AH	55AH	Total
1992	75	144	114	102	108	543
1993	90	126	102	84	126	528
1994	96	114	75	105	135	525
1995	105	90	150	90	75	510
1996	90	75	135	75	90	465
1997	105	60	165	45	120	495
1998	115	85	160	100	145	605

22. What was the approximate percentage increase in the sales of 55AH batteries in 1998 compared to that in 1992?

- A) 28%
- B) 31%
- C) 33%
- D) 34%

23. The percentage of 4AH batteries sold to the total number of batteries sold was maximum in the year?

- A) 1994
- B) 1995
- C) 1996

- D) 1997
24. Look the series: 22, 21, 23, 22, 24, 23,
- A) 22
 - B) 24
 - C) 25
 - D) 26
25. Which word does not belong to others?
- A) Dodge
 - B) Flee
 - C) Duck
 - D) Avoid
26. Which of the following is not an essential element of report writing?
- A) Research Methodology
 - B) Reference
 - C) Conclusion
 - D) None of the above
27. Which of the following is non-probability sampling?
- A) Snowball
 - B) Random
 - C) Cluster
 - D) Stratified
28. In group interview, there are
- A) One interviewer and one interviewee
 - B) More than one interviewer and one interviewee
 - C) One interviewer and more than one interviewee
 - D) More than one interviewer and more than one interviewee
29. Uniting various qualitative methods with quantitative methods can be called as
- A) Coalesce

- B) Triangulation
 - C) Bipartite
 - D) Impassive
30. Books and records are the primary sources of data in:
- A) clinical research
 - B) historical research
 - C) laboratory research
 - D) participatory research
31. The important pre-requisites of a researcher in sciences, social sciences and humanities are
- A) laboratory skills, records, supervisor, topic
 - B) Supervisor, topic, critical analysis, patience
 - C) archives, supervisor, topic, flexibility in thinking
 - D) topic, supervisor, good temperament, pre-conceived notions
32. A college wants to give training in use of Statistical Package for Social Sciences (SPSS) to researchers. For this the college should organize
- A) Lecture
 - B) Seminar
 - C) Workshop
 - D) Conference
33. Which One of the following is not a quality of researcher?
- A) Keenness in enquiry
 - B) He must be of alert mind
 - C) His assertion to outstrip the evidence
 - D) Unison with that of which he is in search
34. Null means?
- A) One
 - B) Two

- C) Zero
 - D) None of the above
35. The depth of any research can be judged by:
- A) title of the research
 - B) duration of the research
 - C) objectives of the research
 - D) total expenditure on the research
36. Fundamental research reflects the ability to:
- A) Expound new principles
 - B) Synthesize new ideals
 - C) Evaluate the existing material concerning research
 - D) Study the existing literature regarding various topics
37. A ratio represents the relation between
- A) Part and Part
 - B) Part and Whole
 - C) Whole and Whole
 - D) All of the above
38. Circle graphs are used to show:
- A) How one part is related to other parts?
 - B) How various sections share in the whole?
 - C) How one whole is related to other whole?
 - D) How various parts are related to the whole?
39. Field-work based research is classified as:
- A) Historical
 - B) Empirical
 - C) Biographical
 - D) Experimental

40. Statistical measure based upon the entire population is called parameter while measure based upon a sample is known as:
- A) Inference
 - B) Statistics
 - C) Sample parameter
 - D) None of these
41. The importance of the correlation co-efficient lies in the fact that:
- A) It is one of the most valid measure of statistics.
 - B) It is a non-parametric method of statistical analysis.
 - C) There is a linear relationship between the correlated variables.
 - D) It allows one to determine the degree or strength of the association between two variables.
42. Which one of the following is the most comprehensive source of population data?
- A) Census
 - B) National Sample Surveys
 - C) Demographic Health Surveys
 - D) National Family Health Surveys
43. Which correlation co-efficient best explains the relationship between creativity and intelligence?
- A) 0.3
 - B) 0.5
 - C) 0.6
 - D) 1.0
44. Normal Probability Curve should be
- A) Zero skewed
 - B) Positively skewed
 - C) Negatively skewed
 - D) Leptokurtic skewed

45. A doctor studies the relative effectiveness of two drugs of dengue fever. His research would be classified as
- A) Case Study
 - B) Ethnography
 - C) Descriptive Survey
 - D) Experimental Research
46. Newton gave three basic laws of motion. This research is categorized as
- A) Sample Survey
 - B) Applied Research
 - C) Descriptive Research
 - D) Fundamental Research
47. When two or more successive footnotes refer to the same work which one of the following expressions is used?
- A) et.al
 - B) op.cit
 - C) loc.cit
 - D) ibid
48. Nine year olds are taller than seven year olds. This is an example of a reference drawn from
- A) Vertical study
 - B) Time series study
 - C) Experimental study
 - D) Cross-sectional study
49. Which one of the following belongs to the category of good 'research ethics'?
- A) Publishing the same paper in two research journals without telling the editors
 - B) Trimming outliers from a data set without discussing your reasons in a research paper

- C) Conducting a review of the literature that acknowledges the contributions of other people in the relevant field or relevant prior work
 - D) Including a colleague as an author on a research paper in return for a favor even though the colleague did not make a serious contribution to the paper
50. Which of the following are the basic rules of APA style of referencing format?
- A) Alphabetically index reference list
 - B) Invert authors' names (last name first)
 - C) Italicize titles of longer works such as books and journals
 - D) All of the above

Section-II
Mechanical Engineering

51. Two square matrices **A** and **B** have same order and have ranks 4 and 3 respectively. The rank of the product **A** x **B** is
- Greater than or equal to 4
 - Greater than 3
 - Greater than 12
 - Less than or equal to 3
52. If the inverse of a matrix is equal to its transpose, then the type of the matrix is
- Skew Hermitian
 - Skew symmetric
 - Orthogonal
 - Hermitian
53. The value of $\lim_{n \rightarrow \infty} \left(1 + \frac{m}{n}\right)^n$ is
- e^m
 - e^n
 - ∞
 - None of the above
54. Solution of the differential equation $y^2 \frac{dy}{dx} = \frac{3}{7}x, y(0) = 5$ is
- $14y^2 = 9x^2 + 2250$
 - $14y^2 = 9x^3 + 2000$
 - $14y^3 = 9x^2 + 1750$
 - $14y^3 = 9x^2 + 1500$
55. Real part of the complex number $e^{5+i\pi}$ is
- 1
 - $-e^5$
 - 1
 - e^5
56. If 150 dice are rolled, how many 5 as outcome are likely?
- 30
 - 25
 - 33
 - 28
57. Starting from $x_0 = 1$, one step of Newton-Raphson method in solving the equation $x^3 + 3x - 7 = 0$ gives the next value as
- $X_1 = 1.2$
 - $X_1 = 2.1$
 - $X_1 = 1.5$
 - $X_1 = 5.1$
58. Which of the following pair has same dimensions?

- a. Force and power
 - b. Energy and work
 - c. Momentum and energy
 - d. Impulse and momentum
59. Four forces P , $2P$, $3P$ and $4P$ act along the sides of a square, taken in order. The magnitude of the resultant force is
- a. Zero
 - b. $\sqrt{2} P$
 - c. $2 P$
 - d. $2\sqrt{2} P$
60. A zero torque acting on a system will result in conservation of
- a. Linear velocity
 - b. Angular velocity
 - c. Angular momentum
 - d. Moment of momentum
61. Dimensional formula for Young's modulus of elasticity is
- a. $ML^{-1}T^{-2}$
 - b. MLT^{-2}
 - c. $M^{-1}L^{-1}T^{-1}$
 - d. $ML^{-2}T^{-2}$
62. Which of the following materials has the highest value of Poisson's ratio?
- a. Steel
 - b. Copper
 - c. Wood
 - d. Rubber
63. The strain energy stored in a body due to external loading, within the elastic limit, is known as
- a. Malleability
 - b. Ductility
 - c. Toughness
 - d. Resilience
64. Silicon in cast iron
- a. Makes the casting unsound
 - b. Promotes the formation of graphite
 - c. Aids fusibility and fluidity
 - d. Makes the iron soft and machinable
65. Two links, for which the relative motion is combination of sliding and turning nature, form a
- a. Sliding pair
 - b. Lower pair
 - c. Turning pair
 - d. Higher pair
66. Which of the following is a positive drive?
- a. V – groove belt drive
 - b. Timing belt drive
 - c. Flat belt drive

- d. Crowned belt drive
67. For 30° angle of friction, efficiency of a screw thread is
- 33%
 - 73%
 - 53%
 - 63%
68. Critical damping depends upon
- Stiffness and amplitude
 - Mass and frequency of system
 - Mass and stiffness
 - Stiffness and viscosity of medium
69. Rayleigh's energy method can be applied to a system which has
- Non-conservative force
 - Constant potential energy
 - Constant kinetic energy
 - Conservative force
70. The bearing pressure is exerted at right angles to the shaft axis in a
- Foot step bearing
 - Collar bearing
 - Radial bearing
 - Taper roller bearing
71. In the Lewis equation, the working stress depends upon
- Material of the tooth and pitch line velocity
 - Pitch line velocity and load conditions
 - Load conditions and material of the tooth
 - Pitch line velocity, Load conditions and material of the tooth
72. Factor of safety for fatigue loading is expressed as ratio of
- Yield strength to working stress
 - Ultimate strength to design stress
 - Endurance limit to allowable stress
 - Yield strength to ultimate strength
73. Which of the following is true for hydrostatic bearings?
- Oil pressure is generated by rotation of journal
 - Pressurized oil is supplied to the journal
 - Load carrying capacity depends upon viscosity of oil
 - None of these
74. Poise is the unit of
- Density
 - Velocity gradient
 - Kinematic viscosity
 - Dynamic viscosity
75. The resultant hydrostatic force acts at a point known as
- Centre of pressure

- b. Centre of buoyancy
 - c. Centre of gravity
 - d. Centre of mass
76. The Darcy-Weisbach friction factor f (measure of resistance to flow in pipes) depends upon
- a. Relative roughness, surface tension and viscosity
 - b. Relative roughness, velocity and viscosity
 - c. Roughness height, diameter, velocity and kinematic viscosity
 - d. Surface tension, diameter and velocity
77. Which of the following is true for an impulse turbine?
- a. Operates submerged in water
 - b. Works by complete conversion of head to kinetic energy
 - c. Is meant for low head installations
 - d. Works by conversion of head to pressure energy
78. Priming is done in
- a. Screw pumps
 - b. Reciprocating pumps
 - c. Centrifugal pumps
 - d. Impulse turbines
79. The molecular kinetic energy of a gas is proportional to its absolute temperature as
- a. T
 - b. \sqrt{T}
 - c. $T^{3/2}$
 - d. T^2
80. Which of the following thermodynamic cycle is used in steam engines?
- a. Carnot
 - b. Bell-coleman
 - c. Rankine
 - d. Brayton
81. For an adiabatic process, if volume is decreased then which of the following takes place?
- a. Heat conduction
 - b. Increase in temperature and decrease in pressure
 - c. Decrease in temperature and pressure
 - d. Increase in temperature and pressure
82. The heat conduction through a hollow cylinder, having inner and outer radii as R_1 and R_2 respectively, is a function of
- a. R_2/R_1
 - b. $\text{Log}_e(R_1/R_2)$
 - c. $\text{Log}_e(R_2/R_1)$
 - d. R_1/R_2
83. Emissivity of a body having transmissivity and reflectivity of 0.25 and 0.35 respectively is
- a. 0.40
 - b. 0.55
 - c. 0.10

- d. 1.04
84. One tonne of refrigeration can be expressed as melting of 1000 kg of ice in
- 1 minute
 - 720 minutes
 - 120 minutes
 - 1440 minutes
85. Horizontal lines in psychometric charts represent
- Dew point temperature
 - Dew point depression
 - Constant humidity ratio
 - Relative humidity
86. Alloys in which mercury is one of the metals are called
- Emulsions
 - Amalgams
 - Haematics
 - Magnolias
87. Which of the following alloy is used for manufacturing food-processing machinery?
- Monel metal
 - Alnico
 - Inconel
 - Pewter
88. Which process involves increasing the cross-sectional area by pressing or hammering in a direction parallel to the original ingot axis?
- Peening
 - Swaging
 - Upsetting
 - Setting down
89. Misrun is a casting defect which occurs due to
- Very high pouring temperature of metal
 - Insufficient fluidity of the molten metal
 - Absorption of gases by the liquid metal
 - Improper alignment of the moulds
90. The welding process using flux in the form of granules is
- Gas welding
 - DC arc welding
 - Submerged arc welding
 - Plasma arc welding
91. Chills are used in casting moulds to
- Achieve directional solidification
 - Reduce possibility of blow holes
 - Reduce the freezing line
 - Increase the smoothness of cast surface
92. In orthogonal cutting, the angle at which the cutting face is inclined to the direction of cut is
- 90 degree

- b. Less than 90 degree
 - c. Between 30 and 45 degrees
 - d. Greater than 90 degree
93. Which of the following is not orthogonal cutting process?
- a. Sawing
 - b. Broaching
 - c. Slotting
 - d. Milling
94. Thrust force will increase with the increase in
- a. Side cutting edge angle
 - b. Tool nose radius
 - c. Rake angle
 - d. None of these affect thrust force
95. In a single point turning operation with cemented carbide and steel combination, Taylor exponent is 0.25. If the cutting speed is halved, the tool life will become
- a. half
 - b. Double
 - c. Four times
 - d. Sixteen times
96. The design of cutting tools is based on
- a. Tensile strength
 - b. Rigidity
 - c. Compactness
 - d. Bending stress
97. Which of the following is not true in the context of electro-discharge machining?
- a. Metal removal is very fast
 - b. Tool and workpiece are separated by dielectric fluid
 - c. Good surface finish is obtained
 - d. Suitable for machining soft or hard electricity conducting materials
98. Choose the correct statement
- a. A fixture is used to guide the tool as well as to locate and clamp the workpiece
 - b. A jig is used to locate and clamp the workpiece as well as to guide the tool
 - c. Jigs are used in CNC machines to locate the workpiece and guide the tool
 - d. All of the above are true
99. Which of the following is false for CNC machines?
- a. CNC machines are soft-wired
 - b. Speed cannot be varied during machining
 - c. Tape readers are not used
 - d. Interpolation algorithms are used
100. In industrial engineering, PERT stands for
- a. Project Execution & Re-evaluation Tool
 - b. Program Evaluation & Review Technique
 - c. Probabilistic Events Research Technique
 - d. Project Execution Reporting Tool

