

Ph.D. ENTRANCE EXAMINATION, August-2026

Name of Candidate

Roll No. of the Candidate

Date of Examination

Answer Sheet No.

Signature of the Candidate.....

Signature of the Invigilator(s)

1.

2.

Time: 2 Hours**Maximum Marks: 100****IMPORTANT INSTRUCTIONS**

- i. The question paper is in the form of Test-Booklet containing **100 (Hundred)** questions. Each question may carry maximum four answer marked. (A), (B), (C) and (D) out of which only one is correct.
- ii. There are 100 multiple choice questions, each question carrying 1 mark. The test includes 50 questions of Research Methodology (Part A) and 50 questions of the subject/Domain (Part B).
- iii. On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **100** questions (50 in Part-A+50 in Part-B). Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.
- iv. A separate Answer- Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are 100 rows containing four circles each. One row pertains to one question.
- v. The candidate should write his/her roll number at the places provided on the cover page of the Test-Booklet/ Question Paper and on Answer Sheet and NOWHERE ELSE.
- vi. No second test -Booklet /Question Paper and Answer -Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.
- vii. For every correct answer of the question **One (1) mark will be awarded**. For every unattempted question/ wrong answer, zero (0) mark shall be awarded. **There is no Negative Marking**.
- viii. Marking shall be done only on the basis of answers responded on the Answer- Sheet.
- ix. To mark the answer on the Answer- Sheet, candidate should **darken** the appropriate circle in the row of each question with Blue or Black pen.
- x. For each question, only one circle should be darkened as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the question will be treated as cancelled.
- xi. The candidates should not remove any paper from the Test- Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.
- xii. Rough work may be done on the blank space provided in the Test- Booklet /Question Paper only.
- xiii. Mobile phones (even in Switch -off mode) and such other communication/ programmable devices are not allowed inside the examination hall.
- xiv. No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO

(PART-A)

1. Which of the following statements is true about the collection of data?
 - a. The data that is collected from the place of origin is known as primary data
 - b. The data that is collected from the place of origin is known as secondary data
 - c. The data that is collected from the place of origin is known as tertiary data
 - d. None of the above
2. Which of the following is the main point of difference between primary data and secondary data?
 - a. The collection of secondary data is costlier and more time consuming when compared to primary data
 - b. The secondary data is always original whereas the primary data is not
 - c. The primary data is much more reliable than secondary data because it is collected directly from respondents
 - d. None of the above
3. Which of the following is an example of qualitative data?
 - a. Temperature readings in Celsius
 - b. Monthly income in dollars
 - c. Transcript of an interview
 - d. Total population count
4. How is qualitative data usually analyzed?
 - a) By using statistical formulas and graphs
 - b) By finding themes, patterns, and categories
 - c) By running computer software for percentages
 - d) By measuring numerical weight or length
5. Which graph is used to show cumulative frequency?
 - a) Bar graph
 - b) Ogive
 - c) Histogram
 - d) Pie chart
6. Which chart is most suitable to show the comparison of parts to a whole?
 - a) Line graph
 - b) Histogram
 - c) Frequency polygon
 - d) Pie chart
7. In a moderately asymmetrical (skewed) distribution, what is the empirical relationship between mean, median, and mode?
 - a. $\text{Mean} - \text{Mode} = 3(\text{Mean} - \text{Median})$
 - b. $\text{Mean} = \text{Median} + \text{Mode}$
 - c. $\text{Mode} = 3\text{Mean} - 2\text{Median}$
 - d. $\text{Median} = \text{Mean} / \text{Mode}$
8. Which measure of central tendency includes the magnitude of scores?
 - a. Mean
 - b. Mode
 - c. Median
 - d. Range
9. What is the mean of the following numbers: 23, 45, 87, 40, 50?
 - a. 59
 - b. 49
 - c. 56
 - d. 39

10. Which of the following are methods under measures of dispersion?
- Standard deviation
 - Mean deviation
 - Range
 - All of the above
11. _____ and _____ are types of measures of dispersion.
- Nominal, Real
 - Nominal, Relative
 - Absolute, Relative
 - Real, Relative
12. The standard deviation of a set of 90 observations is 105. If the value of each observation is decreased by 9, then the new standard deviation of these observations would be _____.
- 96
 - 105
 - 100
 - None of the above
13. The average of squared deviations from the arithmetic mean is known as _____.
- Quartile deviation
 - Standard deviation
 - Variance
 - None of the above
14. If Mohan secures 97 percentiles in an examination, it means that his position is below _____ of the total candidates who had appeared in the exam.
- 97 percent
 - 3 percent
 - 90 percent
 - None of the above
15. Which of the following cannot be calculated for open-ended distributions?
- Standard deviation
 - Mean deviation
 - Range
 - None of the above
16. The interquartile range (IQR) is calculated as:
- $Q3 - Q1$
 - $Q3 + Q1$
 - $Q1 - Q3$
 - $Q1 \times Q3$
17. Which of the following statements is TRUE?
- Standard deviation is less reliable than range.
 - Mean deviation uses all scores.
 - Quartile deviation uses the entire dataset.
 - Range uses all scores.
18. If range is 20 and the smallest value is 5, the largest value is:
- 25
 - 15
 - 30
 - Cannot be determined
19. A distribution with low variability is considered:
- Scattered
 - Skewed
 - Consistent
 - Unreliable

20. Coefficient of variation is helpful in:
- Finding mode
 - Comparing variability between two datasets
 - Identifying mean
 - Finding median
21. If the variance is 16, then the standard deviation is:
- 8
 - 4
 - 2
 - 16
22. Kurtosis is a measure of:
- Central tendency
 - Dispersion
 - Symmetry
 - Skewness
23. Choose the correct option concerning the correlation analysis between 2 sets of data.
- Multiple correlations is a correlational analysis comparing two sets of data.
 - A partial correlation is a correlational analysis comparing two sets of data.
 - A simple correlation is a correlational analysis comparing two sets of data.
 - None of the preceding.
24. Which one of the below statements regarding the regression line is correct?
- The prediction equation is another name for a regression line.
 - A regression line is also referred to as the line of the average relationship.
 - The estimating equation is another name for a regression line.
 - All of the above.
25. Who introduced the term 'regression'?
- Karl Pearson
 - R.A Fischer
 - Croxtton and Cowden
 - Francis Galton.
26. Company A produces 10% defective products, Company B produces 20% defective products and C produces 5% defective products. If choosing a company is an equally likely event, then find the probability that the product chosen is defective.
- 0.12
 - 0.21
 - 0.22
 - 0.11
27. A well-defined research problem helps the researcher most by:
- Determining the exact budget
 - Guiding the selection of the research design and methods
 - Eliminating the need for a literature review
 - Guaranteeing publication in a journal
28. Why is a literature review critical during problem formulation?
- It proves that your bias is correct
 - It helps reveal gaps and inconsistencies in existing knowledge
 - It provides unrelated background facts
 - It replaces the need to state research objectives
29. Which of the following statement is correct?
- Reliability ensures the validity
 - Validity ensures reliability
 - Reliability and validity are independent of each other
 - Reliability does not depend on objectivity

30. The study in which the investigators attempt to trace an effect is known as:
- Survey Research
 - Summative Research
 - Historical Research
 - 'Ex-post Facto' Research
31. Generalized conclusion on the basis of a sample is technically known as:
- Data analysis and interpretation
 - Parameter inference
 - Statistical inference
 - All of the above
32. Authenticity of a research finding is its:
- Originality
 - Validity
 - Objectivity
 - All of the above
33. Which technique is generally followed when the population is finite?
- Area Sampling Technique
 - Purposive Sampling Technique
 - Systematic Sampling Technique
 - None of the above
34. Research problem is selected from the stand point of:
- Researcher's interest
 - Social relevance
 - Financial support
 - Availability of relevant literature
35. The research is always –
- Verifying the old knowledge
 - Exploring new knowledge
 - Filling the gap between knowledge
 - All of these
36. Manipulation of independent variable is always a part of
- Historical research
 - Fundamental research
 - Descriptive research
 - Experimental research
37. The Factorial Analysis is used:
- To know the relationship between two variables
 - To know the difference among the many variables
 - To know the difference between two variables
 - To test the Hypothesis
38. Which of the following is classified in the category of the developmental research?
- Philosophical research
 - Action research
 - Descriptive research
 - All the above
39. What is the name of the conceptual framework in which the research is carried out?
- Research hypothesis
 - Research design
 - Research paradigm
 - Synopsis of Research
40. Which of the following features are considered as critical in qualitative research?
- 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.
41. Tippit table refers to as _____
- a. Table of random digits
 - b. The table used in sampling methods
 - c. The table used in statistical investigations
 - d. All of the above
42. What are the conditions in which Type-I error occurs?
- a. The null hypotheses get accepted even if it is false
 - b. The null hypotheses get rejected even if it is true
 - c. Both the null hypotheses as well as alternative hypotheses are rejected
 - d. None of the above
43. Research and Development become the index of development of the country. Which of the following reasons are true with regards to this statement?
- a. R&D targets human development
 - b. R&D can enhance people's standard of living in the country
 - c. R&D reflects the actual economic and social conditions being prevailed in the country
 - d. All the above
44. What is the main aim of interdisciplinary research?
- a. To over simplify the problem of research
 - b. To bring out the holistic approach to research
 - c. To create a new trend in research methodology
 - d. To reduce the emphasis on a single subject in the research domain
45. A researcher is interested in studying the prospects of a particular political party in an urban area. So, what tool should he prefer for the study?
- a. Rating Scale
 - b. Interview
 - c. Questionnaire
 - d. Schedule
46. The conclusions/findings of which type of research cannot be generalized to other situations?
- a. Casual Comparative Research
 - b. Historical Research
 - c. Descriptive Research
 - d. Experimental Research
47. Which one is called non-probability sampling?
- a. Quota sampling
 - b. Cluster sampling
 - c. Systematic sampling
 - d. Stratified random sampling
48. What are the core elements of a dissertation?
- a. Introduction; Data Collection; Data Analysis; Conclusions and Recommendations
 - b. Executive Summary; Literature Review; Data Gathered; Conclusions; Bibliography
 - c. Research Plan; Research Data; Analysis; References
 - d. Introduction; Literature Review; Research Methodology; Results; Discussions and Conclusions
49. The "Sociogram" technique is used to study _____
- a. Vocational Interest
 - b. Human Relations
 - c. Professional Competence
 - d. Achievement Motivation
50. Action-research can be understood as _____

- a. A longitudinal research
- b. An applied research
- c. A kind of research being carried out to solve a specific problem
- d. All of the above

(PART-B)

51. An industrial heat pump operates between the temperatures of 27°C and 13°C . The rates of heat addition and heat rejection are 750W and 1000W , respectively. The COP for the heat pump is
- (A) 6.5 (B) 7.5
(C) 4.0 (D) 3.0
52. An ideal Brayton cycle, operating between the pressure limits of 1 bar and 6 bar, has minimum and maximum temperatures of 300 K and 1500 K. The ratio of specific heats of the working fluid is 1.4. The approximate final temperatures in Kelvin at the end of the compression and expansion processes are, respectively,
- (A) 500 and 900 (B) 900 and 500
(C) 500 and 500 (D) 900 and 900
53. An ideal gas of mass m and temperature T_1 Undergoes a reversible isothermal process from an Initial pressure p_1 to a final pressure p_2 . The heat Loss during the process is Q . The entropy change Δs of the gas is
- (A) $mR\ln(p_2/p_1)$ (B) $mR\ln(p_1/p_2)$
(C) $mR\ln(p_1/p_2) - Q/T_1$ (D) Zero
54. A thermodynamic system is considered to be an isolated one if
- (A) mass transfer and entropy change are zero
(B) entropy change and energy transfer are zero
(C) energy transfer and mass transfer are zero
(D) mass transfer and volume change are zero
55. Which law states that the specific heat of a gas remains constant at all temperatures and pressures?
- (A) Charles' law (B) Joule's law
(C) Regnault's law (D) Boyle's law
56. Which of the following statements are TRUE with respect to heat and work?
- (i) They are boundary phenomena
(ii) They are exact differentials
(iii) They are path functions
- (A) both (i) and (ii) (B) both (i) and (iii)
(C) both (ii) and (iii) (D) only (iii)
57. Boyle's law i.e., $pV = \text{constant}$ is applicable to gases under
- (A) Small range of pressures (B) High range of pressures
(C) Steady change of pressures (D) All range of pressures
58. Two long parallel surfaces have emissivity of 0.85 each. Determine the number of thin parallel shields of equal emissivity to reduce the exchange by 80%.
- (A) 3 (B) 4
(C) 5 (D) 6
59. In the case of one-dimensional heat conduction in a medium with constant properties, T is the temperature at position x , at time t . then $\partial T / \partial t$ is proportional to
- (A) $\partial^2 T / \partial x^2$ (B) $\partial T / \partial x$
(C) $\partial^2 T / (\partial x \partial t)$ (D) T/x
60. With an increase in thickness of insulation around a circular pipe, heat loss to

- surroundings due to
- (A) convection increases, while that due to conduction decreases
(B) convection decreases, while that due to conduction increases
(C) Convection and conduction decreases
(D) Convection and conduction increases
61. The heat transfer takes place according to
(A) Zeroth law of thermodynamics (B) First law of thermodynamics
(C) Second law of thermodynamics (D) Kirchhoff's law
62. What is the ratio of thermal conductivity to electrical conductivity equal to?
(A) Prandtl number (B) Schmidt number
(C) Lorenz number (D) Lewis number
63. Heat is conducted through a 10 cm thick wall at rate of 30 W/m^2 . When the temperature difference across wall is 10°C ? What is the thermal conductivity of wall?
(A) 0.03 W/mK (B) 0.3 W/mK
(C) 03 W/mK (D) 30 W/mK
64. If k is thermal conductivity and h is convective heat transfer coefficient, a fin will be necessary and effective only when
(A) k is small and h is large (B) k is large and h is also large
(C) k is small and h is also small (D) k is large and h is small
65. The outer surface of a long cylinder is maintained at constant temperature. The cylinder does not have any heat source. The temperature in the cylinder will:
(A) increase linearly with radius (B) decrease linearly with radius
(C) be independent of radius (D) vary logarithmically, with radius
66. Metals and gases respond rapidly to temperature changes as compared to non-metals and liquids due to
(A) High thermal conductivity (B) Low thermal diffusivity
(C) High thermal diffusivity (D) High heat capacity
67. The critical radius of insulation for asbestos with $k=0.125 \text{ W/mK}$ surrounding a pipe exposed to room air with $h=2.5 \text{ W/m}^2\text{K}$ is
(A) 50 mm (B) 5 mm
(C) 2 mm (D) 20 mm
68. In MLT θ system, the dimension of thermal conductivity is:
(A) $\text{ML}^{-1}\text{T}^{-1}\theta^{-1}$ (B) $\text{MLT}^{-1}\theta^{-1}$
(C) $\text{MLT}^{-3}\theta^{-1}$ (D) $\text{MLT}^{-2}\theta^{-1}$
69. For the same compression ratio and the same heat input, the correct sequence of the increasing order of the thermal efficiencies of the given cycles is
(A) Otto, Diesel, Dual (B) Diesel, Dual, Otto
(C) Dual, Diesel, Otto (D) Dual, Otto, Diesel
70. The efficiency of diesel cycle approaches to Otto cycle efficiency when
(A) Cut off ratio is zero (B) Cut off ratio increased
(C) Cut off ratio is decreased (D) Cut of ratio is equal to unity
71. As compared to air standard cycles, in actual working, the effect of variation in specific heats is to
(A) increase maximum pressure and maximum temperature
(B) decrease maximum pressure and maximum temperature
(C) increase maximum pressure and decrease temperature
(D) decrease maximum pressure and increase maximum temperature
72. The main object of Morse test is to find out
(A) performance of a petrol engine
(B) Performance of a diesel engine
(C) Frictional power of a petrol engine
(D) indicated power of a single cylinder diesel engine

73. For the minimum work in compressor operating between limit P_1 and P_3 . The intercooler P_2 is given by:
(A) $P_2 = \sqrt{P_1 + P_3}$ (B) $P_2 = \sqrt{P_1 - P_3}$
(C) $P_2 = \sqrt{P_1 \cdot P_3}$ (D) $P_2 = P_1 + P_3$
74. In a multistage compressor, inter cooling is done to
(A) Maximize power consumption (B) Maximize compressor temperature
(C) Maximize compressor work (D) Minimize compressor work
75. In the window air conditioner, the expansion device used is
(A) capillary tube (B) thermostatic expansion valve
(C) automatic expansion valve (D) float valve
76. The comfort conditions in air conditioning system are defined by
(A) 22°C DBT and 60% RH (B) 18°C DBT and 60% RH
(C) 18°C DBT and 80% RH (D) 22°C DBT and 80% RH
77. In SI unit, one ton of refrigeration is equal to
(A) 210 J/min (B) 21 kJ/min
(C) 21 J/min (D) 210 kJ/min
78. COP of a refrigerator on a reversed Carnot cycle is 5. The ratio of higher absolute temperature to the lower temperature (i.e., T_2/T_1) is
(A) 1.1 (B) 1.2
(C) 1.3 (D) 1.4
79. A one-ton capacity water cooler cools water steadily from 35°C to 20°C. The specific heat of water is 4.18 kJ/kg.K. The water flow rate will be, nearly
(A) 13.33 l/h (B) 33.3 l/h
(C) 200 l/h (D) 250 l/h
80. In winter air conditioning, the process is
(A) heating, humidification and cooling
(B) heating, humidification and heating
(C) heating, dehumidification and heating
(D) cooling, dehumidification and heating
81. Which of the following refrigerant characteristics change constantly during the cooling cycle?
(A) pressure and phase (B) temperature and pressure
(C) phase and flow (D) flow and pressure
82. Which is not true about steam jet refrigeration?
(A) It uses water as refrigerant (B) It can be used below 0°C
(C) Can be used in breweries (D) None of the above
83. The coefficient of performance (COP) of a refrigerator working between temperature, T_1 and T_2 , is 2.41. The COP of heat pump working between same two temperatures, T_1 and T_2 , is:
(A) 3.41 (B) 0.41
(C) 2.41 (D) 1.41
84. Which refrigeration system is driven by low grade energy?
(A) Gas cycle refrigeration (B) Steam jet refrigeration
(C) Vortex tube systems (D) Thermo-electric refrigeration
85. In centrifugal pumps, maximum efficiency is obtained when the blades are
(A) Straight (B) Bent forward
(C) Bent backward (D) Radial
86. The function of guide vanes in a reaction turbine is to
(A) Allow the water to enter the runner without shock
(B) Allow the water to flow over them, without forming eddies

- (C) Allow the required quantity of water to enter the turbine
(D) All of the above
87. If a pump is handling water and is discharging a certain flow Q at a constant total dynamic head requiring a definite B.H.P., the same pump when handling a liquid of specific gravity 0.75 and viscosity nearly same as of water, the horse power required will be
(A) Same (B) 0.75 B.H.P.
(C) B.H.P./0.75 (D) 1.5 B.H.P.
88. The speed ratio in case of Francis turbine varies from
(A) 0.15 to 0.3 (B) 0.4 to 0.5
(C) 0.6 to 0.9 (D) 1 to 1.5
89. In axial flow fans and turbines, fluid enters and leaves as follows
(A) Radially, axially (B) Axially, radially
(C) Axially, axially (D) Radially, radially
90. If N = Speed of the pump impeller, Discharge of a centrifugal pump is
(A) Directly proportional to N (B) Inversely proportional to N
(C) Directly proportional to N^2 (D) Inversely proportional to N^2
91. In which collector the efficiency is maximum
(A) Flat Plate (B) Line Focusing
(C) Evacuated Tube (D) Paraboloid Dish
92. A collector has an area of 6m^2 , an overall heat-loss coefficient of $5\text{W/m}^2\text{K}$, absorber temperature of 80°C , and ambient temperature of 30°C . Calculate heat loss.
(A) 1500 W (B) 1500 KW
(C) 1500 kWh (D) 150 kWh
93. A solar furnace is designed primarily for:
(A) Low-temperature heating (B) Very high-temperature applications
(C) Water storage only (D) Crop irrigation
94. Solar detoxification is mainly associated with:
(A) Treatment of pollutants (B) Solar refrigeration
(C) Solar casting (D) Solar Water heating
95. In a solar still, water vapour condenses on the:
(A) Boiler (B) Transparent cover
(C) Ground (D) Insulation
96. The non-convective zone of a solar pond primarily:
(A) Promotes convection (B) Suppresses convection
(C) Eliminates solar radiation (D) Produces electricity directly
97. The power available in wind is proportional to:
(A) V (B) V^2
(C) V^3 (D) $1/V$
98. A tidal turbine has a swept area of 40 m^2 . Seawater density is 1025 kg/m^3 , and tidal current velocity is 2 m/s . Calculate the power available in the tidal current.
(A) 328 kW (B) 82 kW
(C) 41 kW (D) 164 kW
99. The theoretical maximum wind turbine efficiency is known as:
(A) Carnot limit (B) Betz limit
(C) Rankine limit (D) Newton limit
100. The minimum wind speed at which a turbine starts producing useful power is called:
(A) Rated speed (B) Cut-out speed
(C) Cut-in speed (D) Maximum speed

=== END OF PAPER ===

Answer Key of Research Methodology

- 1. a**
- 2. c**
- 3. c**
- 4. b**
- 5. b**
- 6. d**
- 7. a**
- 8. a**
- 9. b**
- 10. d**
- 11. c**
- 12. b**
- 13. c**
- 14. b**
- 15. b**
- 16. a**
- 17. b**
- 18. a**
- 19. c**
- 20. b**
- 21. b**
- 22. d**
- 23. c**
- 24. d**
- 25. d**

- 26. a**
- 27. b**
- 28. b**
- 29. c**
- 30. d**
- 31. a**
- 32. c**
- 33. c**
- 34. b**
- 35. d**
- 36. d**
- 37. b**
- 38. d**
- 39. b**
- 40. c**
- 41. d**
- 42. b**
- 43. d**
- 44. b**
- 45. c**
- 46. b**
- 47. a**
- 48. d**
- 49. b**
- 50. c**

SKILL FACULTY OF ENGINEERING AND TECHNOLOGY
SKILL DEPARTMENT OF GREEN TECHNOLOGY (MECHANICAL)

Answer Key - PhD

Question No.	Answer
Q 51.	C
Q 52.	A
Q 53.	B
Q 54.	C
Q 55.	C
Q 56.	B
Q 57.	A
Q 58.	B
Q 59.	A
Q 60.	A
Q 61.	C
Q 62.	C
Q 63.	B
Q 64.	D
Q 65.	D
Q 66.	C
Q 67.	A
Q 68.	C
Q 69.	B
Q 70.	A
Q 71.	B
Q 72.	C
Q 73.	C
Q 74.	D
Q 75.	A

Question No.	Answer
Q 76.	A
Q 77.	D
Q 78.	B
Q 79.	C
Q 80.	B
Q 81.	B
Q 82.	B
Q 83.	A
Q 84.	B
Q 85.	C
Q 86.	D
Q 87.	B
Q 88.	C
Q 89.	C
Q 90.	A
Q 91.	D
Q 92.	A
Q 93.	B
Q 94.	A
Q 95.	B
Q 96.	B
Q 97.	C
Q 98.	D
Q 99.	B
Q 100.	C