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**PD-31**

**Total No. of Pages : 12**

**M.Phil./Ph.D. Entrance Examination, 2025**  
**MECHANICAL ENGINEERING**  
**Sub. Code:58752**

**Day and Date : Wednesday, 10-09-2025**

**Total Marks : 100**

**Time : 4.00 p.m. to 6.00 p.m.**

**Instructions:**

1. All questions are compulsory.
2. Each question carries 2 marks.
3. Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
4. Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.
5. Follow the instructions given on OMR Sheet.
6. Rough work shall be done on the sheet provided at the end of question paper.
7. Only non programmable calculators are allowed.

1. To pursue the research, which of the following is priority required?

- A) Developing a research design
- B) Formulating a research question
- C) Deciding about the data analysis procedure
- D) Formulating a research hypothesis

2. 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) The hypotheses get rejected even if it is false

3. Which of the following is not the method of Research?

- A) Survey
- B) Experiment
- C) Observation
- D) Philosophical

4. 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
5. A formal document that presents the research objectives, design of achieving these objectives, and the expected outcomes/derivables of the study is called
- A) Research design
  - B) Research proposal
  - C) Research hypothesis
  - D) Research report
6. Which of the following is true regarding research objectives?
- A) Research objectives, when achieved, will provide sufficient earnings
  - B) Research objectives, when obtained, will ensure the viability of the marketing research department.
  - C) Research objectives, when achieved, provide the information necessary to solve the problem.
  - D) Research objectives are seldom achieved but should be stated as goals to be sought
7. Which one is called non-probability sampling?
- A) Quota sampling
  - B) Cluster sampling
  - C) Systematic sampling
  - D) Stratified random sampling
8. Random sampling is also called .....
- A) Availability sampling
  - B) Probation sampling
  - C) Probability sampling
  - D) Prospect sampling
9. What type of chart is useful for comparing values over categories?
- A) Pie Chart
  - B) Column Chart
  - C) Line Chart
  - D) Dot Graph

10. Which of the following is not a data collection method?
- A) Observation
  - B) Schedules
  - C) Interview
  - D) Research question
11. The primary goal of applied research is to?
- A) Solve or provide answers to practical problems
  - B) Testing theories and hypotheses
  - C) Addressing research issues in partnership with local people
  - D) Primary goal is gaining knowledge, with no aim of using it
12. Quantitative content analysis is an approach that aims to?
- A) Objectively and systematically measure the content of a text
  - B) Subjective interpretation of the content of text data
  - C) Systematic arrangement of documents
  - D) Interpretative analysis and classification of data
13. Literature review is not usually concerned with helping in
- A) objective setting
  - B) research instrument design
  - C) literary appreciation
  - D) subsequent data collection
14. .... is the classical form of research?
- A) Experiment
  - B) Case study
  - C) Grounded theory
  - D) Narrative inquiry
15. What is a bibliography?
- A) A true story written about someone
  - B) Another name for writing a book.
  - C) A religious book.
  - D) A list of sources used in a report and where they can be found.

16. In which type of research would a researcher seek to understand the cultural meanings in a particular social setting?
- A) Ethnographic research                      B) Case study  
C) Experimental research                      D) Survey research
17. A research design that collects data from the same subjects repeatedly over a period is called
- A) Cross-sectional study                      B) Case study  
C) Longitudinal study                      D) Experimental study
18. In research ethics, obtaining informed consent from participants means
- A) Providing participants with all information about the study before they agree to participate  
B) Keeping participant information confidential  
C) Ensuring that participants receive compensation  
D) Requiring participants to answer all questions
19. Which of the following is NOT a method for collecting qualitative data?
- A) Interviews  
B) Focus groups  
C) Surveys with closed-ended questions  
D) Observations
20. The process of drawing a sample from a population in such a way that every member has an equal probability of being included is called
- A) Cluster sampling  
C) Simple random sampling  
B) Quota sampling  
D) Stratified sampling

21. In a research study, the reliability of a measurement refers to
- A) How well the measurement aligns. with theoretical constructs
  - B) The consistency of the measurement over time
  - C) The validity of the research findings
  - D) The precision of the data
22. Which type of research uses both qualitative and quantitative methods?
- A) Basic research
  - B) Mixed-methods research
  - C) Experimental research
  - D) Descriptive research
23. The main purpose of a pilot study is to
- A) Gather data to support the main study
  - B) Test the feasibility and design of the main study
  - C) Publish initial results
  - D) Obtain funding for research
24. Which of the following is an ethical principle in research?
- A) Maximizing sample size
  - B) Informed consent
  - C) Reducing the sample cost
  - D) Ensuring the researcher's freedom
25. The measure of the "central tendency" of data includes all the following EXCEPT
- A) Mean
  - B) Median
  - C) Mode
  - D) Range



30. A 4-bar mechanism with all revolute pairs has link lengths 120 mm,  $l_{in}=40$  mm,  $l_{co}$  50 mm and  $l_{out}$  60 mm. The suffixes 'f', 'in', 'co' and 'out' denote the fixed link, the input link, the coupler and output link respectively. Which one of the following statements is true about the input and output links?
- A) Both links can execute full circular motion
  - B) Both links cannot execute full circular motion
  - C) Only the output link cannot execute full circular motion
  - D) Only the input link cannot execute full circular motion
31. Tooth interference in an external involute spur gear pair can be reduced by
- A) decreasing centre distance between gears
  - B) decreasing module
  - C) decreasing pressure angle
  - D) increasing number of teeth
32. Pre-tensioning of a bolted joint is used to
- A) strain harden the bolt head
  - B) decrease stiffness of the bolted joint
  - C) increase stiffness of the bolted joint
  - D) prevent yielding of the thread root
33. The Poisson's ratio for a perfectly incompressible linear elastic material is
- A) 1
  - B) 0.5
  - C) 0
  - D) Infinity

34. A solid circular shaft needs to be designed to transmit a torque of 50N.m. If the allowable shear stress of the material is 140MPa, assuming a factor of safety of 2. the minimum allowable design diameter in mm is
- A) 8                                      B) 16  
C) 24                                      D) 32
35. Which one of the following is NOT a rotating machine?
- A) Centrifugal pump                      B) Gear pump  
C) Jet Pump                                  D) Vane Pump
36. A flow field which has only convective acceleration is
- A) A steady uniform flow  
B) An unsteady uniform flow  
C) A steady non-uniform flow  
D) An unsteady non-uniform flow
37. In descending order of magnitude, the thermal conductivity of (a) Pure iron, (b) liquid water, (c) Saturated water vapor, (d) for Pure aluminum can be arranged as
- A) a b c d                                      B) d a b c  
C) b c a d                                      D) d e b a
38. Biot number signifies the ratio of
- A) convective resistance in the fluid to conductive resistance in the solid  
B) conductive resistance in the solid to convective resistance in the fluid  
C) inertia force to viscous force in the fluid  
D) buoyancy force to viscous force in the fluid



39. The emissive power of a blackbody is P. If its absolute temperature is doubled, the emissive power becomes
- A) 2P                                      B) 4P  
C) 8P                                      D) 16P
40. If a closed system is undergoing an irreversible process, the entropy of the system
- A) must increase  
B) always remains constant  
C) must decrease  
D) can increase, decrease, or remain constant
41. If a mass of moist air in an airtight vessel is heated to a higher temperature, then
- A) Specific humidity of the air increases  
B) Specific humidity of the air decreases  
C) Relative humidity of the air increases  
D) Relative humidity of the air decreases
42. Consider an ideal vapour compression refrigeration cycle. If the throttling process is replaced by an isentropic expansion process, keeping all the other processes unchanged, which one of the following statements is true for the modified cycle?
- A) Coefficient of performance is lower than that of the original cycle.  
B) Refrigerating effect is lower than that of the original cycle.  
C) Coefficient of performance is higher than that of the original cycle.  
D) Coefficient of performance is the same as that of the original cycle.
43. Which one of the following is the most appropriate control chart for measuring the variability of individual readings within a sample?
- A)  $\bar{X}$  - Chart                                      B) R - Chart  
C) P - Chart                                      D) C - Chart

44. The part of a gating system which regulates the rate of pouring of molten metal is
- A) pouring basin                      B) choke  
C) runner                                D) ingate
45. In an arc welding process, welding speed is doubled. Assuming all other process parameters to be constant, the cross-sectional area of the weld bead will
- A) increase by 20%                      B) increase by 50%  
C) reduce by 25%                      D) reduce by 50%
46. In ultrasonic machining process, the material removal rate will be higher for material with
- A) Higher toughness                      B) Higher ductility  
C) Lower toughness                      D) Higher fracture strain
47. The crystal structure of austenite is
- A) body centered cubic                      B) face centered cubic  
C) hexagonal closed packed                      D) body centered tetragonal
48. In powder metallurgy, sintering of the component
- A) increases density and reduces ductility  
B) increases porosity and reduces density  
C) increases density and reduces porosity  
D) increases porosity and reduces brittleness
49. The process used for producing continuous insulation coating on an electrical wire is
- A) Extrusion                                B) Blow moulding  
C) Injection moulding                      D) Deep drawing

50. In PERT chart, the activity time distribution

A) Normal

B) Poisson

C) Binomial

D) Beta

□□□

**- Rough Work -**