

Seat No.	
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M.Phil./Ph.D. Entrance Examination, July - 2022
MECHANICAL ENGINEERING

Day and Date : Saturday, 16 - 07 - 2022
Time : 11.00 a.m. to 1.00 p.m.

Total Marks : 100

- 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) What are valid research definitions from below?
 - A) Discovery of new things that have been independently verified by other professionals
 - B) Work around to the problem at hand
 - C) Search for knowledge/Art of scientific investigation
 - D) All of above

- 2) Select the correct objective of research from below
 - A) Discover phenomena unknown so far
 - B) Conduct survey
 - C) Find the solution according to set procedure
 - D) None of above

3) Identify correct statement from below:

Research

- A) Should aim at meaningful contribution and ingenuity
 - B) Should be based on clear shortcomings/gaps/limitations identified in existing phenomena
 - C) Should get wider acceptance to the contributions by way of reviewed publications and citations by future works
 - D) All of the above
- 4) Descriptive type of research does not involve
- A) Capturing current state of affairs with no control on factors or variables
 - B) Extensive experiments and observations
 - C) Finding the cause for this current state, tries compare/correlate Surveys, fact finding enquiries
 - D) Obtain information to describe phenomena
- 5) Research based on experiments conducted in the laboratory, taking the observations and then analyzing them is categorized as
- A) Qualitative research
 - B) Conceptual research
 - C) Empirical research
 - D) Descriptive research
- 6) What is a research design?
- A) Way of conducting research that is not grounded in theory
 - B) Choice between using qualitative or quantitative methods
 - C) Framework for the collection and analysis of data
 - D) Style to present your research findings

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- 7) The probability of selecting an item in probability sampling, from the population is known and is
 - A) One
 - B) Non-Zero
 - C) Zero
 - D) None of these
- 8) What is a cross-sectional design?
 - A) Comparison of two or more variables longitudinally
 - B) Collection of data from more than one case at one moment in time
 - C) Research into one particular section of society
 - D) None of these
- 9) Which of the following is research design?
 - A) Descriptive Research Design
 - B) Co-relational Research Design
 - C) Experimental Research Design
 - D) All of the above
- 10) The choice of research design is influenced by the
 - A) Nature of the research problem
 - B) Audiences for the study
 - C) Researchers' personal experiences
 - D) All of the above
- 11) Research design strategy includes all of the below components except
 - A) Data collection design
 - B) Sampling design
 - C) Instrument development
 - D) Data analysis

- 12) Confidence level is _____whereas, significance level is_____.
- A) Probability of true value of the parameter lying outside the range, Probability of true value of the parameter lying inside the range
 - B) Probability of true value of the parameter lying inside the range, Probability of true value of the parameter lying outside the range
 - C) Probability of true value of the parameter lying within one standard deviation range, Probability of true value of the parameter lying one standard deviation away from the range
 - D) Probability of true value of the parameter lying inside the range, Probability of true value of the parameter lying one standard deviation away from the range
- 13) The effectiveness of Questionnaire checking for data analysis does not depend on
- A) Data completeness
 - B) “Right” kind of respondents
 - C) Understanding of the respondents
 - D) None of these
- 14) Analysis of defective parts manufactured per shift in a manufacturing company will be considered as
- A) Univariate analysis
 - B) Bi-variate analysis
 - C) Multivariate analysis
 - D) Regression analysis
- 15) Which of below is a measure of dispersion?
- A) Mean
 - B) Median
 - C) Variance
 - D) Mode

- 16) Content validity of the measurement refers to
- A) how well one measure predicts an outcome for another measure
 - B) how well a test or experiment measures up to its claims
 - C) how well a measuring instrument provides adequate coverage of the topic under study
 - D) All of above
- 17) The hypothesis that an analyst is trying to prove is called the:
- A) Elective hypothesis
 - B) Alternative hypothesis
 - C) Optional hypothesis
 - D) Null hypothesis
- 18) The level of significance in hypothesis testing is the probability of
- A) Accepting a true null hypothesis
 - B) Accepting a false null hypothesis
 - C) Rejecting a true null hypothesis
 - D) None of these alternatives is correct
- 19) If a hypothesis test leads to the rejection of the null hypothesis
- A) A Type II error must have been committed
 - B) A Type II error may have been committed
 - C) A Type I error must have been committed
 - D) A Type I error may have been committed

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- 20) To determine whether the test statistic of ANOVA is statistically significant, it can be compared to a critical value. What two pieces of information are needed to determine the critical value?
- A) Sample size, number of groups
 - B) Mean, sample standard deviation
 - C) Expected frequency, obtained frequency
 - D) MSTR, MSE
- 21) A research paper is a brief report of research work based on
- A) Primary Data
 - B) Secondary Data
 - C) Primary and Secondary Data
 - D) None of these
- 22) The journal impact factor depends upon
- A) Number of citations
 - B) Number of publications
 - C) Both (A) and (B)
 - D) None of these
- 23) Ontology is
- A) An Indexing Method
 - B) Classification of Internet based documents
 - C) Cataloguing of Internet based documents
 - D) Documentation service
- 24) The list of special terms and phrases used in a research report is given in the form of a
- A) Footnote
 - B) Glossary
 - C) Quotations
 - D) Bibliography

- 25) Bibliography means
- A) Foot Note
B) Quotations
C) Biography
D) List of books referred
- 26) In an un-damped system the vibration is initiated with an initial displacement of 5mm. The amplitude of vibration will be
- A) < 5 mm
B) >5mm
C) = 5mm
D) none of the above
- 27) In spring mass system, ($K=100 \text{ N/m}$, $M=1\text{kg}$) the mass has to be brought down to the equilibrium position without oscillation in the least possible time when disturbed. The coefficient of the damper to be introduced is
- A) 20 KN sec/mm
B) 20 N.sec/mm
C) 10 Kn.sec/cm
D) 10 KN.sec/cm
- 28) A vibrating system is defined by following parameters $m=3\text{kg}$, $k=100 \text{ N/m}$, $C=3\text{N-s/m}$. Determine Damping frequency
- A) 5.75 rad/sec
B) 6.75 rad/sec
C) 8.30 rad/sec
D) None of these
- 29) When material is subjected to fatigue loading the ratio of the endurance limit to the ultimate tensile strength is
- A) 0.20
B) 0.35
C) 0.5
D) 0.65

- 30) The metal suitable for bearings subjected to light loads is
- A) silicon bronze
 - B) white metal
 - C) monel metal
 - D) phosphor bronze
- 31) Thermoplastic materials are those materials which
- A) are formed into shape under heat and pressure and result in a permanently hard product
 - B) do not become hard with the application of heat and pressure and no chemical change occur
 - C) are flexible and can withstand considerable wear under suitable conditions
 - D) are used as friction lining for clutches and brakes
- 32) Meta-heuristic techniques are:
- A) Calculus-based techniques
 - B) Guided Random Search techniques
 - C) Enumerative techniques
 - D) Numerative techniques
- 33) In operations research, the _____ are prepared for situations.
- A) The objective function must be non-linear
 - B) All the constraints must be non-linear
 - C) The objective function and all the constraints must be non-linear
 - D) Either the objective function or at least one constraint must be non-linear
- 34) What is Physical Equation of mass conservation equation for a finite control volume fixed in space?
- A) Net mass flow through the control surface = constant
 - B) Rate of change of mass inside the control volume = constant
 - C) Net mass flow through the control surface = Rate of change of mass inside the control volume
 - D) Net mass flow through the control surface \neq Rate of change of mass inside the control volume

- 35) The quantity specifying the flow or motion is termed as
 - A) Density
 - B) Field
 - C) Flux
 - D) Electrostatic force
- 36) What is the incompressibility condition in Navier-Stokes equation?
 - A) $\nabla \cdot \mathbf{u} = 0$
 - B) $\nabla \cdot \mathbf{u} > 0$
 - C) $\nabla \cdot \mathbf{u} < 0$
 - D) $\nabla \cdot \mathbf{u} = 1$
- 37) Express large scale velocity in terms of \mathbf{K} and ϵ
 - A) $\epsilon^{1/2}$
 - B) $(\epsilon/\mathbf{K})^{1/2}$
 - C) $\mathbf{K}^{1/2}$
 - D) $(\mathbf{K}/\epsilon)^{1/2}$
- 38) The curve passing through the _____ of the isenthalpic is called the inversion curve.
 - A) minima
 - B) maxima
 - C) both of the mentioned
 - D) none of the mentioned
- 39) The Pressure of gas in terms of it's mean kinetic energy per unit volume E is equal to
 - A) $E/2$
 - B) $E/3$
 - C) $2E/3$
 - D) $5E/4$
- 40) Thermodynamic entropy differs from statistical mechanics entropy by a constant_____.
 - A) Critical pressure
 - B) Critical pressure & Boltzmann's constant
 - C) Boltzmann's constant
 - D) None of the mentioned

- 41) Design of condensers use
- A) Film-wise condensation
 - B) Drop-wise condensation
 - C) Film-wise & drop-wise condensation
 - D) None
- 42) How is the performance of the cooling tower indicated?
- A) Wet-bulb temperature
 - B) Dry bulb temperature
 - C) Approach
 - D) Range
- 43) A three high rolling mill consists of three rolls placed one above the other. Which of the following statement is correct?
- A) The upper and middle rolls rotate in the same direction whereas the bottom roll rotates in opposite direction
 - B) The upper and bottom rolls rotate in the same direction whereas the middle roll rotates in opposite direction
 - C) The bottom and middle roll rotate in the same direction
 - D) Any one of the above
- 44) Blow holes in casting are caused by
- A) excessive moisture
 - B) low permeability
 - C) excessive fine grains
 - D) all of the above
- 45) In exponential smoothening method, which one of the following is true?
- A) $0 \leq \alpha \leq 1$ and high value of α is used for stable demand
 - B) $0 \leq \alpha \leq 1$ and high value of α is used for unstable demand
 - C) $\alpha \geq 1$ and high value of α is used for stable demand
 - D) $\alpha \leq 0$ and high value of α is used for unstable demand

- 46) Forging is carried out at which temperature?
- A) Below re-crystallization temperature
 - B) Above re-crystallization temperature
 - C) Below or above re-crystallization temperature
 - D) Above melting point
- 47) Which of the following is NOT the part of the product life cycle?
- A) Introduction
 - B) Growth
 - C) Maturity
 - D) Forecasting
- 48) What is the range of depth-to-diameter ratio in Electron beam machining?
- A) 2:5 to 2:11
 - B) 1:1 to 1:15
 - C) 3:4 to 3:20
 - D) 4:5 to 4:19
- 49) Which of the following are problems with the current rapid prototyping and additive manufacturing technologies?
- A) Limited material variety
 - B) Inability to convert a solid part into layers
 - C) Poor machinability of the starting material
 - D) The inability of the designer to design the part
- 50) _____ helps in establishing the interchangeability of products
- A) Standardization
 - B) Simplification
 - C) Diversification
 - D) Specialization



Rough Work