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M.Phil./Ph.D. Entrance Examination, September - 2022**MECHANICAL ENGINEERING****Sub. Code : 58752****Day and Date : Friday, 23 - 09 - 2022****Total Marks : 100****Time : 01.00 p.m. to 03.00 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. Which of the following research allows us to gain a better understanding of concept and provides direction to start a more structured research?
A) Basic
B) Exploratory
C) Descriptive
D) Applied
2. Identify the item which is not related to literature review
A) Searching review
B) Reviewing the selected literature
C) Data analysis
D) Theoretical and conceptual framework
3. On the basis of nature of investigation, quantitative engineering research is classified as experimental, semi-experimental and non-experimental.
A) True
B) False

P.T.O.

4. A good qualitative problem statement:
- A) Defines the independent and dependent variables
 - B) Conveys a sense of emerging design
 - C) Specifies a research hypothesis to be tested
 - D) Specifies the relationship between variables that the researcher expects to find
5. The principles of engineering experimental design include
- A) Principle of replication
 - B) Principle of randomization
 - C) Both A) and B)
 - D) None of the above
6. Which of the following types of sampling involves the research determining the appropriate sample sizes for the groups identified as important, and then taking convenience samples from those groups?
- A) Proportional stratified sampling
 - B) Quota sampling
 - C) One-stage cluster sampling
 - D) Two-stage cluster sampling
7. The nonrandom sampling type that involves selecting a convenience sample from a population with a specific set of characteristics for your research study is called _____
- A) Convenience sampling
 - B) Quota sampling
 - C) Purposive sampling
 - D) Snowball sampling
8. The following cannot be exploited by assigning or by licensing the rights to others.
- A) Patents
 - B) Designs
 - C) Trademark
 - D) All of the above

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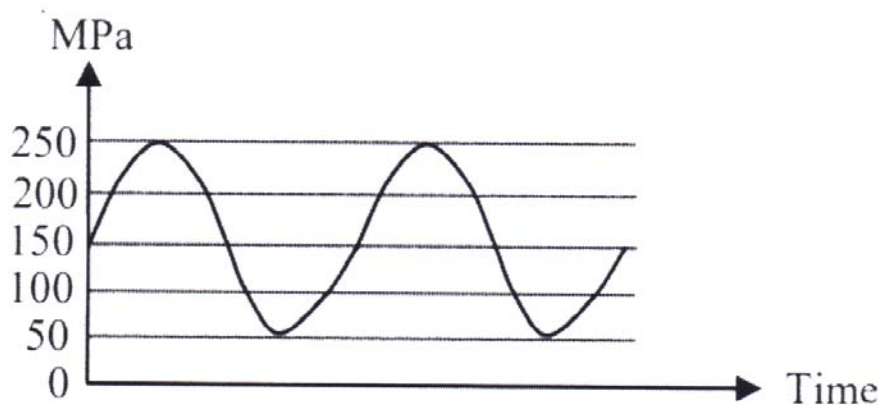
9. What is the name for the type of check list or rating scale that expresses criteria on some point scale to determine the quality of the performance of a student?
 - A) Diffusion
 - B) Rubrics
 - C) Track system
 - D) Deduction
10. Major criteria in evaluation of measuring tool (select most appropriate option)
 - A) Test of validity
 - B) Test of reliability
 - C) Test of practical ability
 - D) All of the above
11. Which of the following is the correct order of the measurement scales in increasing order of accuracy, precision and number of operations used?
 - A) Ratio, Interval, Nominal, Ordinal
 - B) Ordinal, Ratio, Interval, Nominal
 - C) Interval, Ordinal, Ratio, Nominal
 - D) Nominal, Ordinal, Interval, Ratio
12. Includes data concerning the family background and educational development.
 - A) Case study
 - B) General behavior
 - C) Genetic approach
 - D) Adequacy
13. The effectiveness of Questionnaire checking for data analysis does not depend on
 - A) Data completeness
 - B) Number of respondents
 - C) “Right” kind of respondents
 - D) Understanding of the respondents

- 14.** A schedule is generally filled up by
- A) Researcher B) Informants
C) Government D) Local body
- 15.** _____ and _____ are types of measures of dispersion.
- A) Nominal, real B) Nominal, relative
C) Real, relative D) Absolute, relative
- 16.** If a variable has three values- k , 0 and $3k$ with corresponding frequencies as $3k$, $2k$ and k respectively. Then the value of coefficient of skewness is
- A) $2k$ B) 2
C) $1/2$ D) $k/2$
- 17.** If the data about sales and advertisement expenditure of a firm is as under
- | | Sales in Crore Rs | Advertisement expenditure in Crore Rs |
|--------------------|-------------------|---------------------------------------|
| Mean | 40 | 6 |
| Standard deviation | 10 | 1.5 |
- The correlation coefficient between sales and advertisement expenditure is 0.9. The likely sales for a proposed advertisement expenditure of Rs 10 Crore
- A) 64 Crore B) 67 Crore
C) 70 Crore D) 58 Crore
- 18.** A specific, clear, and testable proposition or predictive statement about the possible outcome of a scientific research study based on a particular property of a population.
- A) Statistic B) Hypothesis
C) Level of Significance D) Test-Statistic

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19. If the assumed hypothesis is tested for rejection considering it to be true is called
 - A) Null Hypothesis
 - B) Statistical Hypothesis
 - C) Simple Hypothesis
 - D) Composite Hypothesis
20. A statement whose validity is tested on the basis of a sample is called
 - A) Statistical Hypothesis
 - B) Composite Hypothesis
 - C) Null Hypothesis
 - D) None of these
21. Any hypothesis which specifies the population distribution completely is known as
 - A) Complete Hypothesis
 - B) Composite Hypothesis
 - C) Statistical Hypothesis
 - D) Simple Hypothesis
22. What kind of information is usually presented in the limitations section of a research report?
 - A) An outline of the factors that may have prevented the researcher from conducting more thorough research
 - B) An outline of the extent of the research study
 - C) An outline of the historical background of the research study
 - D) An explanation of the research tools used to gather the data
23. Which words best describe the writing style that should be used in research reports?
 - A) Objective and detached
 - B) Subjective and detached
 - C) Personal and critical
 - D) Emotive and judgmental
24. In the methods section of the report, the researcher needs to :
 - A) Discuss the results of the research
 - B) Discuss the theoretical background for the research
 - C) Set out in detail how data was gathered and analysed
 - D) None of these

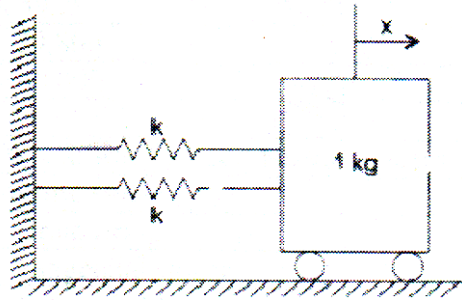
- 25.** The conclusion of a research report
- A) Can introduce new information
 - B) Must be based only on material presented in the report
 - C) Is the same as the abstract except that it is presented at the end of the report
 - D) None of these
- 26.** Consider the following statements for a composite material :
- 1. It is considered to be any multiple materials that exhibit a significant proportion of the properties of both constituents
 - 2. Constituent phases in a composite must be chemically similar
 - 3. A matrix combined with a reinforcing material is used in the composite
 - 4. Thermosetting epoxy resin is used as the matrix for some kinds of composition
- Which of the statements are correct?
- A) 1, 2 and 3
 - B) 1, 2 and 4
 - C) 1, 3 and 4
 - D) 2, 3 and 4
- 27.** For the given fluctuating fatigue load, the values of stress amplitude and stress ratio are respectively



- A) 250MPa and 0.20
- B) 100MPa and 5
- C) 100MPa and 0.20
- D) 250MPa and 5

- 28.** Which of the following is not a desired property of a Matrix?
- A) Increased moisture absorption B) Low shrinkage
C) Low temperature capability D) Dimensional stability
- 29.** A machine of 250 kg mass is supported on springs of total stiffness 100 kN/m. Machine has an unbalanced rotating force of 350 N at speed of 3600 rpm. Assuming a damping factor of 0.15, the value of transmissibility ratio is :
- A) 0.0162 B) 0.16
C) 0.032 D) 0.9922
- 30.** In mathematical modeling of a process, which option is not a characteristic of an analytical solution?
- A) Mathematical equations are used to describe a process
B) Most practical problems cannot be solved
C) Exact information on the quantities of interest is obtained
D) Finite element method is used
- 31.** Homogeneous system of linear equations has a unique solution (the trivial solution) if and only if its determinant is
- A) Zero B) -1
C) Non-Zero D) -3
- 32.** What is the availability of a machine with the following reliability figures?
Mean Time Between Failure (MTBF) = 25 days
Mean Time To Repair (MTTR) = 6 hours
- A) 99.009% B) 99%
C) 10% D) 50%

- 33.** A mass of 1 kg is attached to two identical springs each with stiffness $k = 20 \text{ kN/m}$ as shown in the figure. Under frictionless condition, the natural frequency of the system in Hz is close to



- A) 35
B) 10
C) 23
D) 32
34. Navier-Stokes equation describes the motion of _____.
A) Solid substance
B) Non-viscous fluid
C) Viscous fluid
D) Gas
35. The equation for entrance length L_e in a pipe laminar flow is
A) $L_e/D = 0.08R_e$
B) $L_e/D = 0.04R_e$
C) $L_e/D = 0.06R_e$
D) none of the above
36. _____ and _____ are used in k- ϵ model in addition to k and ϵ to formulate the transport equations.
A) Internal thermal energy and turbulent stress
B) Internal thermal energy and kinetic energy
C) Rate of deformation and turbulent stress
D) Rate of deformation and kinetic energy
37. Most of gases exhibit drop in temperature upon isenthalpic expansion. However, which gas will show rise in temperature upon throttling
A) Carbon dioxide
B) Oxygen
C) Neon
D) Nitrogen

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- 38.** On a hot day at Mumbai tanker is loaded with diesel fuel 40,000 liters. The tanker was driven to Mahabaleshwar, where temperature was 20 C lower than Mumbai. Entire tanker was unloaded. If the coefficient for volume expansion for diesel is $1 \times 10^3/\text{K}$. The quantity of diesel delivered at Mahabaleshwar will be
- A) 40,000 B) 39,200
C) 39,800 D) 40,800
- 39.** Which was first combustion system used for solid fuels?
- A) Firing stoker B) Grate firing
C) Tangential stoker D) Pulverized fuel firing
- 40.** On which of the following does convective heat transfer coefficient doesn't depend?
- A) Orientation of solid surface B) Time
C) Surface area D) Space
- 41.** Fins are provided on a heat transfer surface to
- A) Pressure drop of the fluid should be minimized
B) Increase turbulence in flow for enhancing heat transfer
C) Surface area is maximum to promote the rate of heat transfer
D) Increase temperature gradient so as to enhance heat transfer
- 42.** Dropwise condensation usually occurs on
- A) Glazed surface B) Oil surface
C) Smooth surface D) Any shiny surface
- 43.** Shaping of metal by squeezing them in between two or more dies in order to obtain desired shape is obtained by
- A) Forging B) Welding
C) Forming D) Grinding

44. In which type of extrusion, the die moves toward the unextruded billet
 - A) Forward
 - B) Indirect
 - C) Impact
 - D) None
45. In which of the following metalworking process, the volume of the material is not constant?
 - A) Forging
 - B) Rolling
 - C) Machining
 - D) Extrusion
46. Cold rolling process only affects the tensile strength of the material which being rolled.
 - A) True
 - B) False
47. Which metal is used for preparation of patterns in shell molding?
 - A) Aluminium
 - B) Grey cast iron
 - C) Copper
 - D) Brass
48. Which of the following considerations distinguish die casting from the permanent mold casting
 - A) Moulding material
 - B) Way of pouring molten metal
 - C) Coating on mould
 - D) Size of castings
49. Response based competitive advantage can be
 - A) Flexible response
 - B) Reliable response
 - C) Quick response
 - D) All of the above
50. Strategy to ensure the purchases of new product or high quality product by the customer is called
 - A) upgrading
 - B) core sales
 - C) full line sales
 - D) product line sales



Rough Work

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