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- 5) What does a significant result in a chi-square test imply?
- A) That homogeneity of variance has not been established
 - B) That there is a significant difference between the three categorical variables included in the analysis
 - C) It implies that the sample is not representative of the population
 - D) All of these are possible
- 6) Research method is a part of _____
- A) Problem
 - B) Experiment
 - C) Research Techniques
 - D) Research methodology
- 7) Identifying causes of a problem and possible solution to a problem is
- A) Field Study
 - B) Diagnostic study
 - C) Action study
 - D) Pilot study
- 8) What is the function of a post-test in ANOVA?
- A) Determine if any statistically significant group differences have occurred
 - B) Describe those groups that have reliable differences between group means
 - C) Set the critical value for the F test (or chi-square)
 - D) None of the above
- 9) The first step in formulating a problem is
- A) Statement of the problem
 - B) Gathering of Data
 - C) Measurement
 - D) Survey
- 10) What does a descriptive study seek to accomplish?
- A) Attempts to capture a population's characteristics by making inferences from a sample's characteristics and testing resulting hypotheses
 - B) Emphasizes a full contextual analysis of a few events or conditions and their interrelations
 - C) Discovers answers to the questions who, what, when, where, or how much
 - D) Attempts to reveal why or how one variable produces changes in another

- 11) Last step in problem formulation is
- A) Survey
 - B) Discussion
 - C) Literature survey
 - D) Rephrasing the Research problem
- 12) Which ONE of these is the best description of secondary data?
- A) Ordinary data
 - B) Existing data
 - C) Omnibus data
 - D) Ordinal data
- 13) What level of measurement would be used if participants were asked to choose their favorite picture from a set of six?
- A) Ordinal
 - B) Nominal
 - C) Ratio
 - D) Interval
- 14) Concepts which cannot be given operational definitions are ____ concepts
- A) Verbal
 - B) Oral
 - C) Hypothetical
 - D) Operational
- 15) The _____ is not used as a measure of association for nominal, nonparametric variables.
- A) Chi-square
 - B) Phi
 - C) Cramer's v
 - D) Z score
- 16) A Hypothesis from which no generalization can be made is
- A) Null Hypothesis
 - B) Barren Hypothesis
 - C) Descriptive Hypothesis
 - D) Analytical Hypothesis
- 17) A Hypothesis contributes to the development of _____
- A) Theory
 - B) Generalization
 - C) Evolution
 - D) Concept

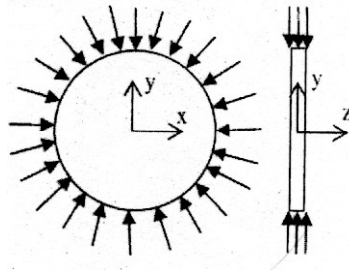
- 18) One or two tail test will determine
- A) If the two extreme values (min or max) of the sample need to be rejected
 - B) If the hypothesis has one or possible two conclusions
 - C) If the region of rejection is located in one or two tails of the distribution
 - D) None of the above
- 19) The null hypothesis for the Mann-Whitney U test is used to test that
- A) Two samples are from different populations
 - B) Two samples are from different populations but have the same mean
 - C) Two samples are from the same population and have the same mean
 - D) Two samples are from the same population and have the same median
- 20) Surveys on the basis of subject matter are of two types (1) Social survey and (2) _____
- A) Economic Survey
 - B) Deep survey
 - C) Intensive Survey
 - D) Extensive Survey
- 21) In a Three year Research Programme _____ time can be devoted for preliminary works
- A) 20%
 - B) 50%
 - C) 17%
 - D) 25%
- 22) What is the function of a post-test in ANOVA?
- A) Determine if any statistically significant group differences have occurred
 - B) Describe those groups that have reliable differences between group means
 - C) Set the critical value for the F test (or chi-square)
 - D) None of the above

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- 23) A comprehensive full Report of the research process is called
- A) Thesis
 - B) Summary Report
 - C) Abstract
 - D) Article
- 24) When analyzing nominal data, which measure of central tendency is appropriate?
- A) Mean
 - B) Mode
 - C) Median
 - D) Range
- 25) Using the _____ sampling technique can result in a skewed sample if periodicity exists in the population.
- A) Simple random
 - B) Systematic
 - C) Stratified
 - D) Cluster
- 26) Critical damping is the
- A) Largest amount of damping for which no oscillation occurs in free vibration
 - B) Smallest amount of damping for which no oscillation occurs in free vibration
 - C) Largest amount of damping for which the motion is simple harmonic in free vibration
 - D) Smallest amount of damping for which the motion is simple harmonic in free vibration
- 27) 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

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- 34) A thin plate of uniform thickness is subject to pressure as shown in the figure below



Under the assumption of plane stress, which one of the following is correct?

- A) Normal stress is zero in the z-direction
 - B) Normal stress is tensile in the z-direction
 - C) Normal stress is compressive in the z-direction
 - D) Normal stress varies in the z-direction
- 35) For Laminar forced convection over a flat plate, if the free stream velocity increases by a factor of 2, the average heat transfer coefficient
- A) remains same
 - B) decreases by a factor of $\sqrt{2}$
 - C) rises by a factor of $\sqrt{2}$
 - D) rises by a factor of 4
- 36) In a heat exchanger, it is observed that $\Delta T_1 = \Delta T_2$ where ΔT_1 is the temperature difference between the two single phase fluid streams at one end and ΔT_2 is the temperature difference at the other end. This heat exchanger is
- A) a condenser
 - B) an evaporator
 - C) a counter flow heat exchanger
 - D) a parallel flow heat exchanger
- 37) Match the Machine Tools (Group A) with the probable Operations (Group B):

Group A	Group B
P) Centre lathe	1) Slotting
Q) Milling	2) Counter-boring
R) Grinding	3) Knurling
S) Drilling	4) Dressing

- A) P-1, Q-2, R-4, S-3
- B) P-2, Q-1, R-4, S-3
- C) P-3, Q-1, R-4, S-2
- D) P-3, Q-4, R-2, S-1

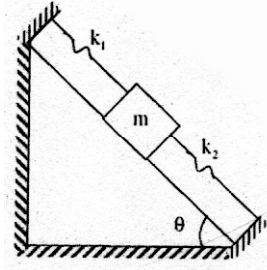
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- 38) The following four unconventional machining processes are available in a shop floor. The most appropriate one to drill a hole of square cross section of $6 \text{ mm} \times 6 \text{ mm}$ and 25 mm deep
- A) is abrasive Jet Machining
 - B) is Plasma Arc Machining
 - C) is Laser Beam Machining
 - D) is Electro Discharge Machining
- 39) Consider a single degree-of-freedom system with viscous damping excited by a harmonic force. At resonance, the phase angle (in degree) of the displacement with respect to the exciting force is
- A) 0
 - B) 45
 - C) 90
 - D) 135
- 40) Consider the turbulent flow of a fluid through a circular pipe of diameter, D . Identify the correct pair of statements.
- I. The fluid is well-mixed
 - II. The fluid is unmixed
 - III. $Re_D < 2300$
 - IV. $Re_D > 2300$
- A) I, III
 - B) II, IV
 - C) II, III
 - D) I, IV
- 41) For a gas turbine power plant, identify the correct pair of statements.
- P) Smaller in size compared to steam power plant for same power output
 - Q) Starts quickly compared to steam power plant
 - R) Works on the principle of Rankine cycle
 - S) Good compatibility with solid fuel
- A) P, Q
 - B) R, S
 - C) Q, R
 - D) P, S

- 42) The hot tearing in a metal casting is due to
- A) high fluidity
 - B) high melt temperature
 - C) wide range of solidification temperature
 - D) low coefficient of thermal expansion
- 43) Which one of the following is used to convert a rotational motion into a translational motion?
- A) Bevel gears
 - B) Double helical gears
 - C) Worm gears
 - D) Rack and pinion gears
- 44) Jobs arrive at a facility at an average rate of 5 in an 8 hour shift. The arrival of the jobs follows Poisson distribution. The average service time of a job on the facility is 40 minutes. The service time follows exponential distribution. Idle time (in hours) at the facility per shift will be
- A) $\frac{5}{7}$
 - B) $\frac{14}{3}$
 - C) $\frac{7}{5}$
 - D) $\frac{10}{3}$
- 45) A cantilever beam of length, L , with uniform cross-section and flexural rigidity, EI , is loaded uniformly by a vertical load, w per unit length. The maximum vertical deflection of the beam is given by
- A) $\frac{wL^4}{8EI}$
 - B) $\frac{wL^4}{16EI}$
 - C) $\frac{wL^4}{4EI}$
 - D) $\frac{wL^4}{24EI}$

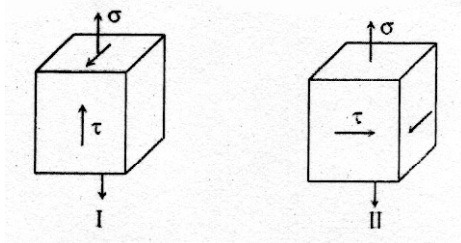
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- 46) What is the natural frequency of the spring mass system shown below? The contact between the block and the inclined plane is frictionless. The mass of the block is denoted by m and the spring constants are denoted by k_1 and k_2 as shown below.



- A) $\sqrt{\frac{k_1 + k_2}{2m}}$ B) $\sqrt{\frac{k_1 + k_2}{4m}}$
 C) $\sqrt{\frac{k_1 - k_2}{m}}$ D) $\sqrt{\frac{k_1 + k_2}{m}}$

- 47) Consider the two states of stress as shown in configurations I and II in the figure below. From the stand point of distortion energy (von-Mises) criterion, which one of the following statements is true?



- A) I yields after II
 B) II yields after I
 C) Both yield simultaneously
 D) Nothing can be said about their relative yielding
- 48) A rectangular hole of size $100 \text{ mm} \times 50 \text{ mm}$ is to be made on a 5 mm thick sheet of steel having ultimate tensile strength and shear strength of 500 MPa and 300 MPa , respectively. The hole is made by punching process. Neglecting the effect of clearance, the punching force (in kN) is
- A) 300 B) 450
 C) 600 D) 750

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49) Match the casting defects (Group A) with the probable causes (Group B):

Group A	Group B
P) Hot tears	1) Improper fusion of two streams of liquid metal
Q) Shrinkage	2) Low permeability of the sand mould
R) Blow holes	3) Volumetric contraction both in liquid and solid stage
S) Cold Shut	4) Differential cooling rate

A) P-1, Q-3, R-2, S-4

B) P-4, Q-3, R-2, S-1

C) P-3, Q-4, R-2, S-1

D) P-1, Q-2, R-4, S-3

50) It is desired to avoid interference in a pair of spur gears having a 20° pressure angle. With increase in pinion to gear speed ratio, the minimum number of teeth on the pinion

A) increases

B) decreases

C) first increases and then decreases

D) remains unchanged



Rough Work

