RESEARCH METHODOLOGY FOR ENGINEERING

1. A pot is fully filled (upto brims) with water. A cube of ice floating in it is partially submerged and partially seen above the water level. As the ice cube fully melts, what will happen to the level of water ?

(A) The water spills over

(B) The water level decreases

(C) The water level remains the same

(D) The water level increases

2. Suppose a 2-dimensional graph is to be plotted, with '*s*' as independent variable, '*p*' as dependent variable and also showing the impact of a 3rd variable, '*q*', on the '*p*' variable, then :

(A) independent variable, '*s*', is plotted along the *x*-axis; dependent variable, '*p*', is plotted along *y*-axis holding '*q*' constant, then other plots of '*s*' *vs.* '*p*' are done, each for a different value of '*q*' held constant.

(B) '*p*' is plotted along *x*-axis; '*s*' is plotted along *y*-axis holding '*q*' constant, then other plots of '*s*' *vs.* '*p*' are done, each for a different value of '*q*' held constant.

(C) '*s*' is plotted along *x*-axis; '*q*' is plotted along *y*-axis holding '*p*' constant, then other plots of '*q*' *vs.* '*s*' are done, each for a different value of '*p*' held constant.

(D) '*p*' is plotted along the *x*-axis; '*q*' is plotted along the *y*-axis holding '*s*' constant, then other plots of '*q*' *vs.* '*p*' are done, each for a different value of '*s*' held constant.

3. In a laboratory experiment, while plotting a graph,

(A) generally, 10 readings are taken, and a graph is plotted by connecting all the points plotted, even if it results in a zig-zag line.

(B) generally, 25 readings are taken, and a graph is plotted by connecting all the points plotted, even if it results in a zig-zag line.

(C) generally, 6 to 8 readings are taken, and a graph is plotted by connecting all the points plotted, even if it results in a zig-zag line.

(D) generally, 6 to 8 readings are taken, and a graph is plotted by drawing a smooth curve passing close to all points but may not touch all/several points.

4. The distinction between parameter and variable is :

(A) Parameter is an intrinsic property of the system and exists even if no input is applied to a system, while variable shows up only in response to applied input(s).

(B) Parameter is a fixed property of the system and exists even if no input is applied to a system, while variable is a variable quantity that shows up only in response to applied input(s).

(C) Parameter is a variable property of the system, while variable is a fixed property of the system.

(D) Parameter is a fixed property of the system and exists only if input is applied to a system, while variable is a variable property that shows up even if no input(s) is (are) applied.

5. In a class, the ratio of number of boys to girls is 5 : 3. What percentage of the students in the class are girls ?

(A) 37.5 %

(B) 50 %

(C) 60 %

(D) 62.5 %

6. If 25% of 260 equals 6.5% of P, what is P ?

(A) 65 (B) 100

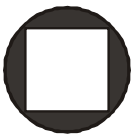
(C) 130 (D) 1000

7. How many different arrangements are there of the letters A, B, C and D ?

(A) 6 (B) 12

(C) 24 (D) 18

8. In the figure below, a square of perimeter 24 is inscribed in a circle. What is the area of shaded region ?



(A) $18\pi - 24$ (B) $18\pi - 36$

(C) $12\pi - 36$ (D) $9\pi - 36$

9. MULTAN : OUOTEN :: PURIFY: _____

(A) RUUIJY (B) OQTVQS

(C) QVSJEZ (D) None of these

10. If word PLAYER is coded as AELPRY, then word MANAGER is coded as :

(A) AEAGMNR (B) AAGEMNR

(C) AAEGMNR (D) AAEGNMR

11. In the sequence below, some letters are missing. From the choices, select the choice that gives the letters that can fill the blanks in the sequence :

a _ b _ _ _ a a _ b c _.

(A) abcabc (B) abccba

(C) abccbc (D) ababcc

12. The entropy of the universe is :

(A) decreasing

(B) increasing

(C) constant

(D) getting halved every year

13. How many 9's are there in the following sequence which are either immediately followed by 9 or immediately preceded by 9 :

793992896793579975

(A) Four (B) Two

(C) Three (D) One

14. What is the next letter in the series ?

B, D, G, K, P, __

(A) S (B) V

(C) W (D) X

15. True value of a quantity can be practically obtained by :

(A) mean of squares of a number of readings taken under no bias conditions such that positive deviations cancel out negative deviations.

(B) mean of a large number of readings taken under no bias conditions such that positive deviations cancel out negative deviations.

(C) whatever is measured by a laboratory or industrial meter.

(D) the actual value obtained after removing parallax error.

16. The sum, s, of probabilities of all outcomes of an event or a statistical experiment is :

(A) zero (B) $0 < s < 1$

(C) $0 \leq s \leq 1$ (D) 1

17. If '+' stands for '–', '–' stands for '×', '×' stands for '÷', and '÷' stands for '+', then evaluate :

$56 \times 7 \div 13 - 11 + 15 - 8 \div 2 - 7$

(A) 30 (B) 45

(C) 60 (D) 90

18. An engineer starts from home and travels 10 m towards West, then turns right and travels 40 m. He then travels 25 m East followed by 50 m towards the South to reach his factory. What is the approximate distance between his home and factory ?

(A) 18 m (B) 125 m

(C) 25 m (D) 105 m

19. A compass was damaged and its needle twisted / turned in such a manner that the pointer which was showing East, now showed North. A man went towards West as per the above mentioned compass. In which direction did he actually go ?

(A) South-West (B) South

(C) North-East (D) North

20. One evening, a person was facing a pole. The shadow of the pole fell to his right. Which direction he was facing ?

(A) East (B) West

(C) North (D) South

21. When a watch shows 3 : 45, the minute hand points towards East. When the watch shows 6 O'clock, in what direction will the hour hand point ?

(A) North (B) South

(C) East (D) West

22. A is the husband of B. E is the daughter of C. A is the father of C. How is B related to E ?

(A) Mother (B) Grandmother

(C) Aunt (D) Cousin

23. If we take the union and intersection respectively of a crisp/classical set with its compliment, what is the resultant in each case ?

(A) 1 and 0 respectively.

(B) 0 and 1 respectively.

(C) Universal set, X, and Null set, ø, respectively.

(D) Null set, ø, and Universal set, X, respectively.

24. If P, Q and R are matrices, and if PQ = PR, then it :

(A) does not imply that Q = R, except if P is non-singular.

(B) always implies that Q = R.

(C) never implies that Q = R.

(D) implies that Q and R are commutative under multiplication.

25. If P and Q are matrices, then :

(A) order of PQ is always the same as that of QP

(B) PQ = QP provided that matrices are conformable for multiplication in both cases

(C) in general, PQ may or may not be equal to QP

(D) both "A" and "B"

26. How many negative integers satisfy $|x+4|+|x-7|<13$?

(A) 2 (B) 3

(C) 4 (D) 5

27. If $x \in R$, the greatest value that $x^4 / (1 + x^8)$ attains is :

(A) 2/5 (B) 1/3

(C) 3/4 (D) 1/2

28. Researcher S's teaching experience (in years) is twice that of researcher M. But 2 years back, S's teaching experience was thrice that of M. How many years S has been teaching ?

(A) 8 years (B) 10 years

(C) 12 years (D) 16 years

29. If you add three quarters of the number of Labs I have, to three quarters of a Lab., you will get the number of Labs I have. How many labs do I have ?

(A) 3 (B) 4

(C) 6 (D) 9

30. A Ph.D. entrance test had 60 questions. A student scores 1 mark for a correct answer, –1/2 for a wrong answer and –1/4 for not attempting a question. A candidate attempted 48 questions and got a net score of 33 marks. How many questions did he attempt wrongly ?

(A) 8 (B) 12

(C) 14 (D) 10

31. Among the visitors to a Lab., the ratio of the number of Professors to B.Tech. students was the same as that of B.Tech. students to Research Scholars. Greater number of visitors were Research Scholars who were attracted by research facilities in the Lab. One day, 7 B.Tech. students visited the said Lab. How many Research Scholars visited the Lab. that day ?

(A) 44 (B) 49

(C) 52 (D) 57

32. A dealer bought an equipment at 30% discount on the list price. He then sold it at a price which is 160% of the list price, thereby making a profit of Rs. 81. What is the list price of the equipment ?

(A) 100 (B) 90

(C) 80 (D) 240

33. A researcher found that for the 1007 pages of his thesis, there were on an average 2 mistakes per page, while in the first 612 pages, there were only 434 mistakes, they seemed to increase for the latter pages. Find the average number of mistakes per page for the remaining pages :

(A) 6 (B) 4

(C) 2 (D) 3

34. After enjoying a feast at my college canteen with 12 friends, I paid Rs. 145 but my each friend paid an equal amount, say X. Later we found that the average sum paid by all of us was Rs. 5 more than what was originally paid by each of my friends. What amount did each friend pay ?

(A) Rs. 120 (B) Rs. 100

(C) Rs. 95 (D) Rs. 80

35. A tank of 60000 litres capacity has three inlet taps P, Q and R which can individually fill the tank in 20, 15 and 12 hours respectively. It has an outlet pipe S which can supply water to 100 houses. If all the pipes are opened simultaneously, how much water enters the tank every hour ?

(A) 8000 litres (B) 9600 litres

(C) 11400 litres (D) 12000 litres

36. In domestic installations, we get phase to ……. voltage which is about …… V while in industrial installations, we usually get phase to …… voltage which is about ……. V:

(A) neutral, 440, phase, 230 (B) neutral, 230, phase, 440

(C) neutral, 230, phase, 400 (D) phase, 230, neutral, 400

37. P, Q, R and S are motor wiremen. Working alone, wireman P can wire 1 motor in 12 hours. Q is 20% faster P. R is 50% faster than P. S is twice as fast as P. In how much time R alone can do wiring of 90 motors ?

(A) 720 hours (B) 600 hours

(C) 320 hours (D) 480 hours

38. P and Q run a closed circuit race. Besides leading just after start, P overtakes Q twice per round. What is P's speed compared to Q's ?

(A) 4 times (B) 3 times

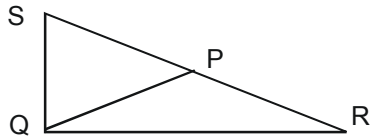
(C) 2 times (D) 5 times

39. An upstream journey of 18 km takes a motor boat 3 hours more than the same distance downstream. If the motor boat speed in still water is twice the speed of the stream, find the speed of the stream :

(A) 7.2 km/hr (B) 6 km/hr

(C) 4.5 km/hr (D) 4 km/hr

40. In the figure below, PQ = PR = PS and angle QRP = 30°. Find angle QSP.



(A) 30° (B) 40°

(C) 45° (D) 60°

41. In the table below, Types of Research are given on left hand side. A few Characteristics are given on the right hand side. Then in the further underneath Table, possible matches are given; select the best choice :

Research Types	**Characteristics**
(a) Fundamental research	(i) Finding out the extent of perceived impact of an intervention.
(b) Applied research	(ii) Developing an effective foundation through theory building.
(c) Action research	(iii) Improving an existing situation through the use of apt interventions.
(d) Evaluative research	(iv) Exploring the possibility of a theory for use in various situations.

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iii)	(iv)
(B)	(ii)	(iii)	(iv)	(i)
(C)	(iii)	(iv)	(i)	(ii)
(D)	(ii)	(iv)	(iii)	(i)

42. A researcher is asked, "What is the probability of finding an apple in the refrigerator ?" The researcher had no idea, neither knowledge nor prior information about an apple having been kept in the refrigerator. Yet he answers, without bias or inclination, as follows; what is his best answer ?

(A) 1.0 (B) 0.75

(C) 0.5 (D) 0

43. While writing a research paper, which one of the following statements is most *true* ?

(A) The 'Abstract' contains a gist of the entire paper but has no citation of references.

(B) The 'Abstract' contains a gist of the entire paper and has citation of references cited in the 'Abstract' part alone.

(C) The 'Future Directions' section must cite the possible offshoots which the authors perceive themselves as well as those perceived by previous researchers.

(D) The 'Materials and Methods' section, if detailed in the paper, must carry out a comprehensive analysis of results.

44. A chain has five links in it, each of which can individually carry a maximum weight of 2.3 Kg, 1.7 Kg, 5.3 Kg, 2.7 Kg and 0.7 Kg. Then which statement is most apt for this chain ?

(A) The strength of this chain is that of the strongest link in it

(B) The strength of this chain is that of the weakest link in it

(C) The strength of this chain is 12.7 Kg

(D) The strength of this chain is the average of the individual link strengths

45. What type of reasoning is used in the following statement ?

"Superiority of intellect depends on its power of concentration on one theme in the same way as a convex lens collects all the rays that strike upon it, into one point" :

(A) Psychological (B) Mathematical

(C) Deductive (D) Analogical

46. In the context of publications, which statement is *true* for SCI ?

(A) Scientific Citation Index is a citation index originally produced by the Institute for Scientific Information and created by Eugene Garfield.

(B) Super Citation Index is a citation index originally produced by the Institute for Scientist's Information and created by Bill Gates.

(C) Science Citation Index is a citation index originally produced by the Institute for Scientific Information and created by Eugene Garfield.

(D) Science Common Index is a citation index originally produced by the Institute for Scientific Information and created by Clarivate Analytics.

47. The term ICT usually refers to :

(A) An acronym that stands for Indian Classical Technologies

(B) Convergence of audio-visual and telephone networks with computer networks through a single cabling or link system

(C) Unified communications and integration of telecommunications, computers, enterprise software, middleware, audio-visual systems and storage

(D) Both "B" and "C"

48. With reference to a fixed frame of reference, your competitor moves forward with a velocity of 9.8 m/second while you too move forward a velocity of 5.2 m/sec with reference to the same frame. What is your velocity vis-à-vis that of your competitor ?

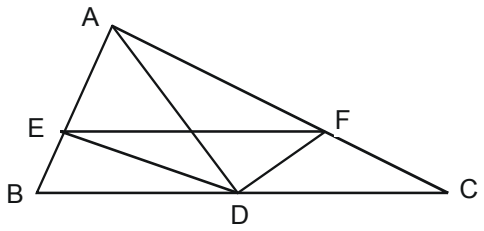
(A) 15 m/sec in forward direction

(B) 4.6 m/sec in forward direction

(C) 7.5 m/sec in forward direction

(D) 4.6 m/sec in backward direction

49. In the following figure (not drawn to scale), angle DEF = 35°. Find the other two angles of triangle DEF if DE and DF are the angle bisectors of angles ADB and ADC respectively :



(A) 30° and 120°

(B) 65° and 80°

(C) 55° and 90°

(D) 70° and 75°

50. A publisher publishes journals in two modes – Subscription mode, and Open access mode. Which choice is most correct in the context of an open access journal :

(A) It is a journal of which the subscription cost is borne by the subscriber.

(B) It is a journal of which the contents are freely accessible by anybody in the world.

(C) It is a journal of which the subscription cost per paper is borne by the respective author.

(D) "B" and "C"

BIOMEDICAL ENGINEERING

51. The type of stethoscope commonly used by most doctors is :

(A) Acoustic stethoscope (B) Electronic stethoscope

(C) Recording stethoscope (D) Doppler stethoscope

52. Name the neurotransmitter thought to be a contributor to feelings of well-being and happiness :

(A) Adrenaline (B) Cortisol

(C) Norepinephrine (D) Serotonin

53. The widening of blood vessels is known as :

(A) Vasoconstriction (B) Atherosclerosis

(C) Vasodilation (D) Thrombosis

54. This technique is used to determine the sex of a fetus :

(A) DNA fingerprinting (B) Autoradiography

(C) Biopsy (D) Amniocentesis

55. The average number of heart beats per minute in a normal adult is in the range :

(A) 100–120 (B) 60–100

(C) 40–60 (D) 52–65

56. Measurements that indicate the healthy functioning of the body, including pulse rate, respiration rate, blood pressure and body temperature are known as :

(A) Vital signs (B) Medical signs

(C) Eponymous signs (D) Prognostic signs

57. A non-invasive technique to record electrical activity of the brain along the scalp using sensors is known as :

(A) Electrocardiography

(B) Electroencephalography

(C) Electrogram

(D) Electrojet

58. An ECG is a medical test that detects heart abnormalities by measuring the electrical activity generated as it contracts. What does ECG stand for ?

(A) Emergency coordination group

(B) Electrocardiograph

(C) Electronic communication gateway

(D) Environmental chemistry group

59. This is one of the latest diseases that created news across the world :

(A) Acquired Immunodeficiency Syndrome (AIDS)

(B) Coronary Artery Disease (CAD)

(C) Chronic Obstructive Pulmonary Disease (COPD)

(D) Ebola Virus Disease (EVD)

60. Normal human body temperature in degrees Celsius is :

(A) 37 ± 0.5 (B) 38.5 ± 0.5

(C) 35.6 ± 0.5 (D) 39 ± 0.5

61. What does the medical term BMI stand for ?

(A) Body mind intellect

(B) Body mass index

(C) Biomedical informatics

(D) Big mouth idiot

62. What is the medical technology that measures brain activity by detecting associated changes in blood flow ?

(A) Functional nuclear magnetic resonance

(B) Structural nuclear magnetic resonance

(C) Computerized axial tomography

(D) Ultrasound scan

63. Medical diagnostic investigations using mainstream instruments involve the following set :

(A) Endoscopy, Electrocardiography, MRI, X-rays

(B) Biopsy, Blood tests, Antibody tests, Blood pressure measurement

(C) Brain scans, Cystoscopy, Pap smear, Allergy shots

(D) Amniocentesis, Autopsy, Thyroid scans, Cholesterol test

64. Name the medical instrument used by doctors to measure blood pressure :

(A) Barometer (B) Thermometer

(C) Sphygmomanometer (D) Reflex hammer

65. The following is a typical example of an artificial organ :

(A) Dialysis machine (B) Cardiac pacemaker

(C) Ventilator (D) Conductivity meter

66. What is the machine designed to move breathable air into and out of the lungs mechanically called ?

(A) Medical intensive care unit

(B) Life-support system

(C) Oxygen supply system

(D) Medical ventilator

67. The major energy currency molecule of the cell is :

(A) Disodium phosphate (B) Glucose-1-phosphate

(C) Triphenyl phosphate (D) Adenosine triphosphate

68. How many pairs of chromosomes are found in human cells ?

(A) 22 (B) 23

(C) 24 (D) 25

69. The teeth and bones of the human body, mainly consist of the following chemical substance :

(A) Calcium phosphate (B) Calcium silicate

(C) Calcium sulphate (D) Calcium carbonate

70. What is the maximum limit of sound beyond which a person can become deaf ?

(A) 60 dB (B) 50 dB

(C) 70 dB (D) 120 dB

71. The left hemisphere of the brain is responsible for the following different functions :

(A) Planning, Cognition, Perception, Aesthetics, Happiness, Positive thoughts

(B) Emotions, Mood, Sleep, Appetite, Motivation, Reward process

(C) Both (A) and (B)

(D) Science, Strategy, Shapes, Stories, Pictures, Observation

72. A United Nations agency to coordinate international healthcare activities and to help governments improve health services is known as :

(A) White House Office

(B) World Health Organization

(C) Global Health Association

(D) International Health Organization

73. What is the biomedical term used for a drug delivery device to produce aerosols to administer medication by respiratory route ?

(A) Defibrillator (B) Ventilator

(C) Nebulizer (D) Vaporizer

74. The word 'polymer' meant for material made from.....

(A) Single entity (B) Two entities

(C) Multiple entities (D) Any entity

75. One of characteristic properties of polymer material.....

(A) High temperature stability

(B) High mechanical strength

(C) High elongation

(D) Low hardness

76. Polymers are .....in nature.

(A) Organic (B) Inorganic

(C) Both (A) and (B) (D) None of these

77. These polymers cannot be recycled :

(A) Thermoplasts

(B) Thermosets

(C) Elastomers

(D) All polymers

78. In general, strongest polymer group is.....

(A) Thermoplasts (B) Thermosets

(C) Elastomers (D) All polymers

79. These polymers consist of coil-like polymer chains :

(A) Thermoplasts (B) Thermosets

(C) Elastomers (D) All polymers

80. Strong covalent bonds exists between polymer chains in.....

(A) Thermoplasts (B) Thermosets

(C) Elastomers (D) All polymers

81. The following is the unique to polymeric materials :

(A) Elasticity (B) Viscoelasticity

(C) Plasticity (D) None of these

82. Elastic deformation in polymers is due to.....

(A) Slight adjust of molecular chains

(B) Slippage of molecular chains

(C) Straightening of molecular chains

(D) Severe of Covalent bonds

83. Kevlar is commercial name for.....

(A) Glass fibres (B) Carbon fibres

(C) Aramid fibres (D) Cermets

84. A transistor is a …….. Operated device.

(A) current (B) voltage

(C) both current and voltage (D) none of these

85. What does LED stand for ?

(A) Light emitting display

(B) Light emitting diode

(C) Low energy display

(D) Light emitting detector

86. 1 mA =

(A) 0.001 A (B) 0.00001 A

(C) 0.01 A (D) 0.1 A

87. CRO stands for :

(A) Cathode Ray Oscillator

(B) Cathode Ray Oscilloscope

(C) Capacitor Resistor Oscillator

(D) Capacitor Resistor Output

88. Which of the following is *not* a measure of central tendency ?

(A) Mean (B) Mode

(C) Range (D) Median

89. Find Mode of the following data set{11,12,14,14} :

(A) 11 (B) 12.8

(C) 13 (D) 14

90. When we say that a person or an object "weighs" a certain number of pounds, we refer to the measure of :

(A) energy (B) force

(C) mass (D) torque

91. The basic unit of contraction is the :

(A) myosin (B) actin

(C) Z-Lines (D) Sarcomeres

92. This is the explanation of how muscles contract :

(A) Lock and Key Hypothesis (B) Cell Theory

(C) Mendel's laws (D) Sliding filament model

93. Which of the following terms describes the body's ability to maintain its normal state ?

(A) Anabolism (B) Catabolism

(C) Tolerance (D) Homeostasis

94. Which cells in the blood do not have a nucleus ?

(A) Lymphocyte (B) Monocyte

(C) Erythrocyte (D) Basophil

95. Which of the following closes and seals off the lower airway during swallowing ?

(A) Alveoli (B) Epiglottis

(C) Larynx (D) Uvula

96. Fertilization of an ovum by a spermatozoon occurs in which of the following structures ?

(A) Cervix (B) Fallopian tube

(C) Ovary (D) Uterus

97. Which of the following is the master gland of the endocrine system ?

(A) Adrenal (B) Pancreas

(C) Pineal (D) Pituitary

98. Which of the following describes the cluster of blood capillaries found in each nephron in the kidney ?

(A) Afferent arteriole (B) Glomerulus

(C) Loop of Henle (D) Renal pelvis

99. Which of the following best describes the process whereby the stomach muscles contract to propel food through the digestive tract ?

(A) Absorption (B) Emulsion

(C) Peristalsis (D) Regurgitation

100. Saliva contains an enzyme that acts upon which of the following nutrients ?

(A) Starches (B) Proteins

(C) Fats (D) Minerals