PART – A

1. I go to the University _____ foot.
   A) with B) on
   C) by D) along

2. This book can be recommended as it is a useful addition _____ our library.
   A) into B) from C) at D) to

3. Dipti is proud _____ her intelligence.
   A) at B) about C) on D) of

4. The KK Express arrived _____ the railway station two hours late.
   A) at B) to
   C) on D) no preposition required

5. She says she cannot consent _____ his proposal.
   A) in B) to
   C) for D) with

6. Unfortunately, the decision is not _____ your favour.
   A) of B) to C) in D) for

7. Vimala and Co. is a famous dealer _____ Toor Dal in Delhi.
   A) for B) of C) in D) at

8. They are not _____ good terms of late.
   A) with B) at C) on D) in

9. Every tragic hero in movies can be observed to have an internal flaw _____ his character.
   A) about B) in C) with D) to

10. Is it better to run _____ the morning or _____ night ?
   A) at; in B) in; at C) in; in D) at; at

**Direction Q 11** : There is a certain relation between two given words on one side of : : and one word is given on another side of : : while another word is to be found from the given alternatives, having the same relation with this word as the given pair has. Select the best alternative.

11. Moon : Satellite : : Earth : ?
    A) Sun
    B) Planet
    C) Solar system
    D) Asteroid

**Direction Q 12 :** There is a certain relation between two given numbers on one side of : : and one number is given on another side of : : while another number is to be found from the given alternatives , having the same relation with this number as the given pair has. Select the best alternative.

12. 6 : 24 : : 4 : ?
    A) 2 B) 6 C) 8 D) 16

**Direction Q 13**: In the given question, four words have been given, out of which three are alike in some manner and the fourth one is different. Choose out the odd one.

13. A) Wheat B) Paddy C) Jowar D) Mustard

**Direction Q 14:** In the given question, four numbers are given. Out of these, three are alike in a certain way but the rest one is different. Choose the one which is different from the rest three.

14. A) 43 B) 53 C) 63 D) 73

**Direction Q 15 :** In the given question, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern.

15. 1, 4, 9, 16, 25, (……)
    A) 35
    B) 36
    C) 48
    D) 49

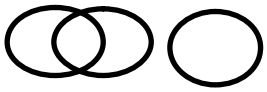
16. If in a certain language, MADRAS is coded as NBESBT, how is BOMBAY coded in that code ?
    A) CPNCBX
    B) CPNCBZ
    C) CPOCBZ
    D) CQOCBZ

17. Which of the following diagrams correctly represents Elephants, wolves, Animals ?

A) 

B) 

C) 

D) 

18. Rashtriya Ekta Diwas is observed across India on 31st October to commemorate the birth anniversary of
    A) Shri Lal Bahadur Shastri
    B) Sardar Vallabh Bhai Patel
    C) Choudhry Charan Singh
    D) Shri Hemwati Nandan Bahuguna

19. Which of the following is a Ramsar Convention Site ?
    A) Sambhar Salt Lake
    B) Ranthambore Tiger Reserve
    C) Gangotri Glacier
    D) Pench Tiger Reserve

20. Which of the following has most number of divisors ?
    A) 99 B) 101 C) 176 D) 182

21. The difference between a number and its three-fifth is 50. What is the number ?
    A) 75 B) 100 C) 125 D) none of these

22. Bob Dylan, who is the 2016 Noble Prize Winner for Literature hails from which of the following countries ?
    A) Germany
    B) United States of America
    C) France
    D) Russia

23. If A : B = 8 : 15 , B : C = 5 : 8 and C : D = 4 : 5, then A : D is equal to
    A) 2 : 7 B) 4 : 15 C) 8 : 15 D) 15 : 4

24. Which of the following pair is not correctly matched ?
    A) Pheeljar Lake – Uttar Pradesh
    B) Phuskar Lake – Rajasthan
    C) Sat Jal – Uttarakhand
    D) Tso Moriri – Laddakh

25. A train moves with a speed of 108 kmph. Its speed in meters per second is
    A) 10.8 B) 18 C) 30 D) 38.8

26. The approximate number of words in an ideal sentence is
A) 5 to 7 words B) 12 to 14 words C) 20 to 22 words D) $\leq$ 30 words

27. Which of the following mode of presentation is most retained by the reader's brain ?
A) Tables B) Text C) Numbers D) Figures

28. On heating ice, its density
A) Increases B) Decreases
C) Remains unchanged D) None of the above

29. Which of the following research methods, doesn't result in an immediate commercial product or idea ?
A) Applied Research B) Basic Research
C) Patent-oriented Research D) All of the above

30. The normal life span of a patent is generally
A) 10 years B) 15 years
C) 8 years D) 20 years

31. If a class of 20 students is consisted of ten students of age of 19 years, four students of age of 20 years and six students of 25 years, the average age of class comes out to be
A) 21.3 years B) 21 years C) 19 years D) 22 years

32. Which is the best way to dilute acid with water ?
A) Addition of water to acid at room temperature
B) Addition of water to acid at room temperature, while heating
C) Addition of acid to water, while heating
D) Addition of acid to water at room temperature

33. Which option is least related to a qualitative approach ?
A) Unstructured B) Flexible
C) Numerical D) Open

34. An interview schedule is a
A) Research Objective B) Data Collection Method
C) Sampling Method D) Variable

35. "Banarasi Saree" can be well protected under the following intellectual property right
A) Copyright B) Layout Design of Integrated Circuits
C) Geographical Indication D) Patent

36. The Harvard referencing system is also known as
    A) The short-title system
    B) The author-date system
    C) The reference by number system
    D) The author-number system

37. Schedule is filled by _____, whereas questionnaire is filled by _____
    A) Respondent, Enumerator
    B) Enumerator, Respondent
    C) Everybody, Respondent
    D) Respondent, Everybody

38. Error arising due to rejecting a correct Null Hypothesis, is termed as
    A) Type I Error
    B) Type II Error
    C) Determinant Errors
    D) Non-determinant Errors

39. Which of the following is not regarded as the central tendency of a given datum ?
    A) Arithmetic Mean B) Median
    C) Mode D) Variance

40. Which of the following statistical operation is best suited for ascertaining the difference in the average results of two groups ?
    A) Arithmetic mean B) t-test C) Mode D) Median

41. Which aspect of the research process could be responsible for the unintended introduction of error in a study ?
    A) Wrong analysis method
    B) Faulty calculations
    C) Flawed sampling methods
    D) All of the above

42. One is guilty of plagiarism if he/she
    A) Make use of the works of others to gather information
    B) Use the work of another and misrepresent it as his/her own
    C) Make use of the works of others to support his/her own arguments
    D) Examine the ideas and arguments of others to help him/her shape his/her own thoughts or views on a particular issue

43. Drawing information or content from the work of another without acknowledging the source by citing a reference is considered to be plagiarism in all of the following cases except
A) Using the exact words of the author
B) Using data that the author has compiled through his/her independent investigation
C) Using information from the author's work that is regarded as common knowledge in the discipline
D) Reproducing in your paper a chart contained in the author's work

44. Which of the following indicator shows pink color at basic pH ?
A) Methyl orange
B) Cresol red
C) Phenolphthalein
D) None of the above

45. What is 5,236 microlitres in litres ?
A) 5.236 litres
B) 0.005236 litres
C) 0.05236 litres
D) 0.5236 litres

46. Law of Conservation of Mass was discovered by
A) Charles Darwin
B) Louis Pasteur
C) Alexander Flemming
D) Antoine Laurent Lavoisier

47. If algae population develops twice in one day, the pond becomes fully occupied by algae on $30^{th}$ day. The pond was half occupied on
A) $29^{th}$ day
B) $15^{th}$ day
C) $14^{th}$ day
D) $28^{th}$ day

48. According to the empirical rule, approximately what percent of the data should lie within mean $\pm 2\sigma$ ?
A) 75%
B) 68%
C) 99.7%
D) 95%

49. Examples of personal protective equipment in the laboratory do not include
A) Long sleeve shirts
B) Lab coats
C) Goggles and long pants
D) Contact lenses

50. In general, Ultraviolet light should be considered dangerous, if
A) it has a wavelength longer than 250 nm
B) it has a wavelength shorter than 250 nm
C) it has a wavelength longer than 400 nm
D) it is seen to have a greenish glow

PART – B

51. Attenuation of solar radiation in earth's atmosphere is due to absorption by
    A) Ozone B) Water vapour
    C) Carbon dioxide D) All the three

52. Pyranometer works based on the principle of
    A) Thermoelectric effect B) Photo-conduction
    C) Laser technology D) Tyndall effect

53. The thermal efficiency of a solar thermal collector can be improved by
    A) putting a selective coating on the absorber
    B) evacuating the space between absorber and glass cover
    B) depositing an anti-reflection coating on the glass cover
    D) all the three

54. The factor which is normally not involved in deciding final cost of purchased electricity is
    A) Maximum demand charge B) Energy charge
    C) Power factor charge D) Reactive power charge

55. Concentration ratio of a solar concentrating collector decreases with increase in
    A) solar insolation B) radiation flux on absorber
    C) collector aperture area D) receiver cooling area

56. The process that converts solid coal into liquid hydrocarbon fuel is called
    A) Liquefaction B) Carbonation
    C) Catalytic conversion D) Cracking

57. A diode with forward bias of 0.8 V is carrying 2.6 mA of current at room temperature. If $\eta$ =1 for this diode, the dynamic resistance (r) of the diode will be
    A) 616 Ω B) 308 Ω C) 20 Ω D) 10 Ω

58. One that is based on forward biased PN junction is
    A) Photo diode B) LED
    C) Photovoltaic cell D) Both A) and B)

59. A thin wafer of _____ converts solar radiation into electricity.
A) sodium B) strontium C) stibium D) selenium

60. In a solar panel, the most common metal used is
A) gold B) copper C) silver D) nickel

61. A solar cell has a short circuit current of 25 mA, an open circuit voltage of 0.6 V and a maximum power output of 12 mW. What is its fill factor ?
A) 70% B) 80% C) 85% D) 95%

62. A module in a solar panel refers to
A) Series arrangement of solar cells
B) Parallel arrangement of solar cells
C) Series and parallel arrangement of solar cells
D) None of the above

63. The current density of a photovoltaic cell ranges from
A) 10 – 20 mA/cm$^2$ B) 40 – 50 mA/cm$^2$
C) 20 – 40 mA/cm$^2$ D) 60 – 100 mA/cm$^2$

64. What is the minimum wavelength absorbed by Ge($E_g$=0.67eV) ?
A) 850 nm B) 1100 nm C) 1850 nm D) 2030 nm

65. Biogas is produced by a particular type of bacterial digestion. The digestion process is called,
A) Normal Digestion B) Anaerobic digestion
C) Aerobic Digestion D) None of these

66. The slope of the graph of $\log_e$(conductivity) versus 1/T (where T is the temperature) for an intrinsic semiconductor with energy gap $E_g$, is
A) $E_g/2k$ B) $-E_g/2k$ C) $E_g/k$ D) $-E_g/k$

67. When the atoms in a solid are separated by their equilibrium distance,
A) the potential energy of the solid is lowest
B) the force of attraction between the atoms is maximum
C) the force of repulsion between the atoms is zero
D) the potential energy of the solids is zero

68. Plastic deformation results from the following
    A) Slip B) Twinning
    C) Both D) None

69. Change in elastic modulus for ordinary materials between 0K and melting point is
    A) 10-20% increase B) 10-20% decrease
    C) 80-90% decrease D) 80-90% increase

70. Which of the following is false ?
    A) Line defects are thermodynamically stable
    B) Dislocation can end inside a crystal without forming loop
    C) ABC ABC ABC…is stacking sequence for HCP crystal
    D) All

71. % C in medium carbon steels ranges from
    A) 0.3 – 0.4 B) 0.3 – 0.5
    C) 0.3 – 0.6 D) None

72. These polymers can not be recycled
    A) Thermoplasts B) Thermosets
    C) Elastomers D) All polymers

73. Dielectric constant for most polymers lies in the range of
    A) 1-3 B) 2-5 C) 4-7 D) 6-10

74. Example for piezo-electric material
    A) Rochelle salt B) Lead zirconate
    C) Potassium niobate D) Barium Titanium oxide

75. Find the wrong statement: Specific heat of a material
    A) Constant for a material B) Heat capacity per unit mass
    C) Extrinsic property D) Has units as J/kg-K

76. Metals can transmit these
    A) X-rays B) Microwaves
    C) Visible light D) Radio waves

77. Capacitors are used for audio frequency and radio frequency coupling and tuning.
A) Air B) Mica C) Plastic film D) Ceramic

78. A laminated iron core has reduced eddy-current losses because
A) more wire can be used with less D.C. resistance in coil
B) the laminations are insulated from each other
C) the magnetic flux is concentrated in the air gap of the core
D) the laminations are stacked vertically

79. An e.m.f. of 16 volts is induced in a coil of inductance 4H. The rate of change of current must be
A) 64 A/s B) 32 A/s C) 16 A/s D) 4 A/s

80. Capacitance between the two conductors of a single phase two wire line is 0.5 $\mu$F/km. What is the value of capacitance of each conductor to neutral ?
A) 0.5 $\mu$F / km B) 1 $\mu$F / km
C) 0.25 $\mu$F / km D) 2.0 $\mu$F / km

81. What is the power factor angle of the load for maximum voltage regulation ?
A) $\tan^{-1}$ (X/R) B) $\cos^{-1}$ (X/R)
C) $\tan^{-1}$ (R/X) D) $\cos^{-1}$ (R/X)

82. What is the line length if a load of 15000 kW at a power factor 0.8 lagging can be delivered by a 3 phase transmission line having conductors each of resistance 1 $\Omega$ per kilometre ? The voltage at the receiving end is to be 132 kV and the loss is about 5%.
A) 40.13 km B) 37.18 km C) 42.38 km D) 35.87 km

83. Transmission efficiency of a transmission line increases with the _____.
A) increase in power factor and voltage
B) decrease in power factor and voltage
C) increase in power factor but decrease in voltage
D) increase in voltage and decrease in power factor

84. The thickness of insulation layer provided on the conductor, in cables depend on
A) Operating voltage B) Current to be carried
C) Power factor D) All of these

85. JFET biasing at DC level can be undertaken by
A) Voltage-divider biasing
B) Individual power source biasing
C) Self-biasing
D) All of the above

86. Which among the following is a military grade op-amp IC ?
A) IC 555
B) IC LF 398
C) IC LM 117
D) IC 741

87. Which reversible phenomenon in a thermocouple device exhibits the absorption and liberation of heat during flow of current through the two dissimilar copper-iron and iron-copper junctions under the application of an external e.m.f. by transforming these junctions to be hot and cold respectively ?
A) Seebeck Effect
B) Peltier Effect
C) Thompson Effect
D) None of the above

88. The amount of heat transferred to convert unit mass of solid to vapour or vice versa is called as
A) latent heat of vaporization
B) latent heat of fusion
C) latent heat of sublimation
D) specific heat

89. A cyclic heat engine operates between a source temperature of 927°C and a sink temperature of 27°C. What will be the maximum efficiency of the heat engine ?
A) 100%
B) 80%
C) 75%
D) 70%

90. What is the pH value of water permissible for boiler ?
A) 0
B) 7
C) slightly less than 7
D) slightly more than 7

91. Which among the following has lowest thermal conductivity among the others ?
A) silver
B) water
C) mercury
D) copper

92. Advantage of gaseous fuel is that
A) it can be stored easily
B) it can mix easily with air
C) it can displace more air from the engine
D) all of the mentioned

93. Hydrocarbons are decomposed into smaller hydrocarbons by
A) reforming B) refining
C) cracking D) polymerization

94. For C.I. engines fuel most preferred are
A) aromatics B) paraffins
C) olefins D) napthenes

95. Which of the following coal has highest calorific value ?
A) Peat B) Lignite
C) Bituminous D) Anthracite

96. Biodiesel can be made from
A) Animal fats B) Vegetable oils
C) Recycled restaurant grease D) All of the above

97. Most fuel ethanol produced in the United States is derived from
A) Sugar beets B) Corn
C) Crop residues D) Switchgrass

98. Combustion reaction is
A) an endothermic reaction B) an exothermic reaction
C) an autocatalytic reaction D) a photochemical reaction

99. What is the calorific value of diesel ?
A) 45 kJ/g B) 46 kJ/g
C) 47 kJ/g D) 48 kJ/g

100. The monitor and control of energy management system is done by using
A) MATLAB B) SCADA
C) AUTO – CAD D) All of these

———————

**SPACE FOR ROUGH WORK**