PART – A

For the word below, a contextual usage is provided. Pick the word from the alternatives given that is most **appropriate** in the given context.

1. Predicament: She began waving frantically at passing motorists as they sped by, but they remained oblivious to her predicament.
   A) Gesture   B) Prediction   C) Intimation   D) Dilemma

2. Four statements with blanks are given followed by four words. Choose the word that fits the set of statements the maximum number of times.
   (I) Saddam Hussein must be persuaded to _____, because the Americans are certainly not going to.
   (II) You cannot see television because it is on the _____
   (III) It was a fierce competition, the loser being whoever chose to _____ first.
   (IV) The corrupt policeman decided to _____ at this particular transgression.
   A) Wink   B) Bow   C) Blink   D) Abdicate

3. Identify the correctly spelt word out of the following options.
   A) Ecceptable   B) Neccessary   C) Collectible   D) Definately

4. A sentence is given in the direct speech and its equivalent statement in the indirect speech is given in the options. Choose the grammatically correct option closest in meaning to the sentence given in the question.

   He said, "Bravo! You have done well."
   A) He applauded him
   B) He told Bravo! he had done well
   C) He applauded him and told him you have done well
   D) He applauded him, saying that he had done well.

5. Which of the following words is an antonym of the word 'reverently' ?
   A) Respectfully   B) Admiringly   C) Insincerely   D) Ardently

6. Find the odd one out.
   A) Green   B) immature   C) Fresh   D) Emerald

Directions for questions 7 and 8 : Select the option that fits in the given blanks the maximum number of times.

7. She could not _____ her bad luck. One should _____ one's promise. He has no _____ for her feelings. He is trying his best to _____ up the reputation of his family.
   A) Fulfill   B) Believe   C) Idea   D) Keep

8. It was difficult to maintain a _____ foothold on the slope. He is a _____ believer

in communism. His future looks _____. My team managed to _____ a place in the finals.

A) Firm   B) Secure   C) Staunch   D) Grim

9. Arrange the phrases to form a meaningful sentence.

  a) in addition to posing a threat to wildlife

  b) associated with big dams

  c) the creation of reservoirs and construction of roads and buildings

  d) affect the quantity

  e) of rain and seepage of water in the catchment area

  A) acdeb   B) baecd   C) cbdea   D) abcde

10. The following question consists of two capitalized words which share a certain relationship with each other, followed by 5 pairs of words. Choose the pair that is related to each other in the **same way** as the capitalized pair.

  LOOK : OGLE

  A) Smile : Stroll   B) Breathe : Gasp

  C) Ring : Talk   D) Plead : Punish

11. The "Earth-Hour" - the planets largest movement for the environment is organized by

  A) World Wide Fund for Nature   B) UNEP

  C) IUCN   D) UNESCO

Directions for questions 12 to 16 : Use the picture to choose the correct answer from the options given below each question.
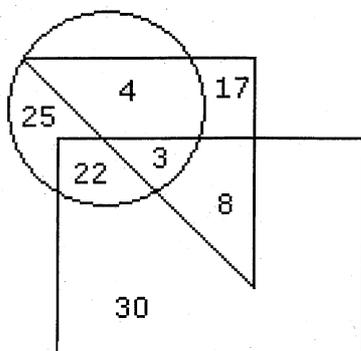
12. How many doctors are neither artists nor players ?

  A) 17   B) 5   C) 10   D) 30

13. How many doctors are both players and artists ?
    A) 22   B) 8   C) 3   D) 30

14. How many artists are players ?
    A) 5   B) 8   C) 25   D) 16

15. How many players are neither artists nor doctors ?
    A) 25   B) 17   C) 5   D) 10

16. How many artists are neither players nor doctors ?
    A) 10   B) 17   C) 30   D) 15

Directions for questions 17 to 20 : Choose the correct answer from the options given below each question.

17. A told B, "The girl I met yesterday was the youngest daughter of the brother–in–law of my friend's mother." How is the girl related to A's friend ?
    A) Niece   B) Cousin   C) Friend   D) Daughter

18. If Arun's birthday is on May 25 which is Monday and his sister's birthday is on July 13. Which day of the week is his sister's birthday ?
    A) Monday   B) Wednesday   C) Thursday   D) Friday

19. P, Q, R, S, T, U, V and W are sitting round the circle and are facing the centre :
    P is second to the right of T who is the neighbour of R and V.
    S is not the neighbour of P.
    V is the neighbour of U.
    Q is not between S and W. W is not between U and S.
    Which two of the following are not neighbours ?
    A) RV   B) UV   C) RP   D) QW

20. Statements : Population increase coupled with depleting resources is going to be the scenario of many developing countries in days to come.
    Conclusions :
    I : The population of developing countries will not continue to increase in future.
    II : It will be very difficult for the governments of developing countries to provide its people decent quality of life.
    A) Only conclusion I follows   B) Only conclusion II follows
    C) Either I or II follows   D) Neither I nor II follows

Directions for questions 21 to 25 : Choose the correct answer from the options given below each question.

21. A bus started from bus stand at 8.00 a.m., and after 30 minutes staying at destination, it returned back to the bus stand. The destination is 27 miles from the bus stand. The speed of the bus is 18mph. In return journey bus travels with 50% fast speed. At what time it returns to the bus stand ?

 A) 10:30 a.m.   B) 10.00 a.m.

 C) 11.00 a.m.   D) 11.30 a.m.

22. The greatest number, which can divide 432, 534 and 398 leaving the same remainder 7 in each, is

 A) 15   B) 16

 C) 17   D) 20

23. In June a baseball team that played 60 games had won 30% of its game played. After a phenomenal winning streak this team raised its average to 50%. How many games must the team have won in a row to attain this average ?

 A) 12   B) 22

 C) 24   D) 35

24. Two boys begin together to write out a booklet containing 535 lines. The first boy starts with the first line, writing at the rate of 100 lines an hour; and the second starts with the last line then writes line 534 and so on, backward proceeding at the rate of 50 lines an hour. At what line will they meet ?

 A) 356   B) 277

 C) 357   D) 267

25. A trader mixes 26 kg of rice at Rs. 20 per kg with 30 kg of rice of other variety at Rs. 36 per kg and sells the mixture at Rs. 30 per kg. His profit percent is

 A) No profit, no loss   B) 5%

 C) 8%   D) 10%

PART – B

26. The heat transfer by conduction through a thick cylinder (Q) is given by (where T_1 = Higher temperature, T_2 = Lower temperature, r_1 = Inside radius, r_2 = Outside radius, l = Length of cylinder, and k = Thermal conductivity)

    A) $Q = [2 \pi lk (T_1 - T_2)]/2.3 \log (r_2/r_1)$

    B) $Q = 2.3 \log (r_2/r_1)/[2 \pi lk (T_1 - T_2)]$

    C) $Q = [2 \pi (T_1 - T_2)]/2.3 \, lk \log (r_2/r_1)$

    D) $Q = 2 \pi lk/2.3 (T_1 - T_2) \log (r_2/r_1)$

27. If the energy radiated per second per sq. cm. of the surface for wave lengths lying between λ, and $\lambda + d\lambda$ is represented by $(E\lambda . d\lambda)$, then $E\lambda$ is called

    A) Absorptive power   B) Emissive power

    C) Emissivity   D) None of these

28. A composite slab has two layers of different materials with thermal conductivities k_1 and k_2. If each layer has the same thickness, then the equivalent thermal conductivity of the slab will be

    A) $k_1 k_2$ B) $(k_1 + k_2)$

    C) $(k_1 + k_2)/ k_1 k_2$ D) $2 k_1 k_2/ (k_1 + k_2)$

29. Two balls of same material and finish have their diameters in the ratio of 2: 1 and both are heated to same temperature and allowed to cool by radiation. Rate of cooling by big ball as compared to smaller one will be in the ratio of

    A) 1:1   B) 2: 1

    C) 1: 2   D) 4: 1

30. Depending on the radiating properties, body will be transparent when
    (Where a = absorptivity, p = reflectivity, x = transmissivity)

    A) P = 0, x = 0 and a = 1   B) P = 1, x = 0, and a = 0

    C) P = 0, x = 1, and a = 0   D) x = 0, a + p = 1

31. The process of heat transfer from one particle of the fluid to another by the actual movement of the fluid particles due to difference of density caused by temperature of the particle is known as

    A) Conduction   B) Free convection

    C) Forced convection   D) Radiation

32. One gram of uranium will produce energy equivalent to approximately

    A) 1 tonne of high grade coal   B) 4.5 tonnes of high grade coal

    C) 10 tonnes of high grade coal   D) 100 tonnes of high grade coal

33. Artificial radioactive isotopes find application in

    A) Power generation   B) Nucleonic devices

    C) Nuclear fission   D) Medical field

34. Pick up the wrong statement.

    A) In a heterogeneous or solid fuel reactor, the fuel is mixed in a regular pattern within moderator

    B) Slow or thermal neutrons have energy of the order or 0.025 eV

    C) Fast neutrons have energies above 1000 eV

    D) Fast reactor uses moderator

35. Ideally the neutron flux in reactor should be

    A) Maximum in centre and zero at side

    B) Maximum at side and zero in canter

    C) Uniform throughout

    D) Zero throughout

36. Plutonium (Pu_{239}) is produced

    A) Artificially   B) When U_{238} is irradiated by neutrons

    C) By fission of Th_{232} D) As basic raw material

37. Superheated steam is generated in following reactor.

A) Boiling water   B) Gas cooled

C) Pressurised water   D) All of the above

38. In a typical medium speed 4-stroke cycle diesel engine the inlet valve

A) Opens at 20° before top dead center and closes at 35° after the bottom dead center

B) Opens at top dead center and closes at bottom dead center

C) Opens at 10° after top dead center and closes 20° before the bottom dead center

D) May open or close anywhere

39. The working pressure and temperature inside the cylinder of an internal combustion engine is _____ as compared to a steam engine.

A) Low   B) Very low

C) High   D) Very high

40. Which of the following fuel detonates readily ?

A) Benzene   B) Iso-octane

C) Normal heptane   D) Alcohol

41. A gas engine has a swept volume of 300 cm^3 and clearance volume of 25 cm^3. Its volumetric efficiency is 0.88 and mechanical efficiency is 0.90. The volume of the mixture taken in per stroke is

A) 248 cm^3 B) 252 cm^3

C) 264 cm^3 D) 286 cm^3

42. As compared to air standard cycle, in actual working, the effect of variation in specific heats is to

A) Increase maximum pressure and maximum temperature

B) Reduce maximum pressure and maximum temperature

C) Increase maximum pressure and decrease maximum temperature

D) Decrease maximum pressure and increase maximum temperature

43. If petrol is used in a diesel engine, then

    A) Low power will be produced   B) Efficiency will be low

    C) Higher knocking will occur   D) Black smoke will be produced

44. Solar radiation consists of following components of radiation

    A) Visible + Infrared + Cosmic Rays

    B) UV + Visible + Microwave

    C) UV + Visible + Infrared

    D) Infrared + Visible + Microwave

45. Daily mean solar irradiation over India is

    A) 5kWh   B) 10 kWh

    C) 10^{12} MJ   D) 10^{40}MJ

46. When two helical springs of equal lengths are arranged to form a cluster spring, then

    A) Shear stress in each spring will be equal

    B) Load taken by each spring will be half the total load

    C) Only A) is correct

    D) Both A) and B) is correct

47. Effective sky temperature is

    A) lower than ambient air temperature

    B) higher than ambient air temperature

    C) equal to ambient air temperature

    D) Either of lower, higher or equal to ambient air temperature

48. Nusselt number is the ratio of

    A) radiative to convective heat transfer coefficient

    B) convective to conductive heat transfer coefficients

    C) conductive to radiative heat transfer coefficient

    D) conductive to convective heat transfer coefficient

49. In a typical absorption refrigeration system the following combination of refrigerants and absorbents is correct.

   A) Water-ammonia
   B) Calcium Chloride-water
   C) Ammonia-lithium chloride
   D) Water-lithium chloride

50. _____ the highest specific heat capacity in low temperature range.

   A) Aluminium
   B) Alumina
   C) Quartz
   D) Water

51. Ductility of a material can be defined as

   A) Ability to undergo large permanent deformations in compression
   B) Ability to recover its original form
   C) Ability to undergo large permanent deformations in tension
   D) All of the above

52. The aluminium alloy made by melting aluminium with 2 to 10% magnesium and 1.75% copper is called

   A) Duralumin
   B) Y-alloy
   C) Magnalium
   D) Hindalium

53. Wrought iron is

   A) Hard
   B) High in strength
   C) Highly resistant to corrosion
   D) Heat treated to change its properties

54. White metal contains

   A) 63 to 67% nickel and 30% copper
   B) 88% copper and 10% tin and rest zinc
   C) Alloy of tin, lead and cadmium
   D) Silver and chromium

55. Eutectoid reaction occurs at

   A) 600°C   B) 723°C

   C) 1147°C   D) 1493°C

56. Higher efficiency in the combustion of solid fuel can not be achieved by

   A) Proper fuel preparation

   B) Keeping the flue gas exhaust temperature very high

   C) Adopting efficient-fuel firing technique & equipment

   D) Supplying correct quantity of combustion air

57. Gross and net calorific value of a fuel will be the same

   A) If its ash content is zero

   B) If its carbon content is very low

   C) If its hydrogen/hydrogen compound content is zero

   D) Under no circumstances

58. Which of the following gaseous fuels has the highest net calorific value (kcal/Nm^3) ?

   A) Producer gas   B) Carburetted water gas

   C) Natural gas   D) Liquified petroleum gas

59. Prandtl number characterizes a

   A) Fluid   B) Solid

   C) Metal   D) All the three

60. Which adsorbant is used for removing Sulphur compounds (SQ, H_2S, RSH etc.) removal from coke oven gas in by-products recovery plant ?

   A) Silica gel   B) Diatomaceous earth

   C) Basalt   D) Bog iron (i.e., moist ferric hydroxide)

61. A sample of natural gas containing 80% methane (CH_4) and rest nitrogen (N_2) is burnt with 20% excess air. With 80% of the combustibles producing CO_2 and the reminder going to CO, the Orsat analysis in volume percent is

   A) CO_2 : 6.26, CO : 1.56, O_2 : 3.91, H_2O : 15.66, N_2 : 72.60

   B) CO_2 : 7.42, CO : 1.86, O_2 : 4.64, N_2 : 86.02

   C) CO_2 : 6.39, CO : 1.60, O_2 : 3.99, H_2O : 25.96, N_2 : 72.06

   D) CO_2 : 7.60, CO : 1.90, O_2 : 4.75, N_2 : 85.74

62. Assuming that CO_2 obeys perfect gas law, calculate the density of CO_2 (in kg/m^3) at 263°C and 2 atm.

   A) 1

   B) 2

   C) 3

   D) 4

63. Heat capacity of air can be approximately expressed as, $Cp = 26.693 + 7.365 \times 10^{-3} T$, where, Cp is in J/moleK and T is in K. The heat given off by 1 mole of air when cooled at atmospheric pressure from 500°C to – 100°C is

   A) 10.73 kJ

   B) 16.15 kJ

   C) 18.11 kJ

   D) 18.33 kJ

64. Equal masses of CH_4 and H_2 are mixed in an empty container. The partial pressure of hydrogen in this container expressed as the fraction of total pressure is

   A) 1/9

   B) 8/9

   C) 1/2

   D) 5/9

65. Which of the following holds good for a solution obeying Raoult's law (i.e., an ideal solution) (where, ΔH = heat of mixing, and ΔV = volume change on mixing) ?

   A) $\Delta H = 1$ (+ve)and $\Delta V = -$ ve

   B) $\Delta H = 0$

   C) $\Delta V = 0$

   D) Both B) and C)

66. At 100°C, water and methylcyclohexane both have vapour pressures of 1 atm. Also at 100°C, the latent heats of vaporisation of these compounds are 40.63 kJ/mole for water and 31.55 kJ/mole for methylcyclohexane. The vapour pressure of water at 150°C is 4.69 atm. At 150°C, the vapour pressure of methylcyclohexane would be expected to be

   A) Significantly less than 4.69 atm.

   B) Nearly equal to 4.69 atm.

   C) Significantly more than 4.69 atm.

   D) Indeterminate due to lack of data

67. What is the total pressure exerted by a mixture of 0.45 kg mole of benzene, 0.44 kg mole of toluene and 0.23 kg mole of *o*-xylene at 100°C, if their vapor pressures at 100°C are 1340, 560 and 210 mmHg respectively ?

   A) 756.2   B) 780.5

   C) 801.5   D) 880.5

68. Which of the following dust collection equipments is the least efficient (for sub-micronic particles) ?

   A) Dust catcher (gravity type)   B) Cyclone separator

   C) Bag filter   D) Hollow wet scrubber

69. Reingleman chart No. 2 corresponds to _____ percent black smoke.

   A) 10   B) 20

   C) 40   D) 80

70. Which of the following is not a practical method of low level radioactive waste disposal?

   A) Dilution with inert material.

   B) Discharging to atmosphere through tall stacks after dilution.

   C) Disposing off in rivers and oceans.

   D) Filling in steel crates and shooting it off out of earth's gravity.

71. In a transformer, zero voltage regulation at full load is

    A) Not possible

    B) Possible at unity power factor load

    C) Possible at leading power factor load

    D) Possible lagging power factor load

72. The q-meter works on the principle of

    A) Mutual inductance   B) Self inductance

    C) Series resonance   D) Parallel resonance

73. In a DC machines, mechanical losses are primary function of

    A) Current   B) Voltage

    C) Speed   D) None of above

74. Buses, trains,trolley, hoists,cranes require high starting torque and therefore make use of

    A) D.C. series motor   B) D.C. shunt motor

    C) Induction motor   D) All of above motors

75. The work function of a semiconductor depends on the location of vacuum level with respect to its

    A) Conduction band edge   B) Valence band edge

    C) Fermi level   D) Impurity level

76. A control system working under unknown random actions is called

    A) Computer control system   B) Digital data system

    C) Stochastic control system D) Adaptive control system

77. Regenerative feedback implies feedback with

    A) Oscillations   B) Step input

    C) Negative sign   D) Positive sign

78. In a stable control system backlash can causes which of the following?

   A) Under damping

   B) Over damping

   C) Poor stability at reduced values of open loop gain

   D) Low level oscillations

79. An increase in gain, in most systems, leads to

   A) Smaller damping ratio   B) Larger damping ratio

   C) Constant damping ratio   D) None of the above

80. Increase in the temperature of a solar photovoltaic cell results in

   A) Increase both in its current and voltage

   B) Decrease both in its current and voltage

   C) Increase in its current and decrease in voltage

   D) Decrease in its current and increase in voltage

81. Cationic doping will make a semiconductor

   A) n – type   B) p – type

   C) Positively charged   D) Negatively charged

82. What is the reason why a common collector is used for impedance matching ?

   A) Its output impedance is very high   B) Its output impedance is very low

   C) Its input impedance is very low   D) Its input impedance is very high

83. The voltage gain of an emitter follower circuit is

   A) High   B) Low

   C) Very high   D) Moderate

84. Which type of diode is used for tuning receivers, operate with reverse bias and derived its name from voltage-variable capacitor ?

   A) Zener diode   B) Tunnel diode

   C) Varacter diode   D) Crystal diode

85. In a push-pull amplifier, an input transformer can be used as a _____ providing equal amplitude input signals opposite in polarity.

    A) Phase reversal   B) Phase-splitter

    C) Limiter   D) Discriminator

86. If the input frequency of a Full-wave rectifier is 400 Hertz, the ripple frequency will be

    A) 800 Hertz   B) 200 Hertz

    C) 100 Hertz   D) 400 Hertz

87. The Bridge method commonly used for finding mutual inductance is

    A) Heaviside Campbell bridge   B) Schearing bridge

    C) De-sauty bridge   D) Wien bridge

88. High speed electrons have wavelength of order

    A) 10^{-15} m   B) 10^{-14} m

    C) 10^{-16} m   D) 10^{-17} m

89. Energy of gamma photon is greater than

    A) 10^2 J   B) 10^{-13} J

    C) 10^{13} J   D) 10^5 J

90. Energy object possesses due to it's position is called

    A) Kinetic energy   B) Mechanical energy

    C) Potential energy   D) Chemical energy

91. Tensile strain is equal to

    A) Force per unit area   B) Force per unit volume

    C) Extension per unit length   D) Force per unit length

92. If there is no transfer of energy between two objects then their temperature is

    A) Same   B) Different

    C) Zero   D) Infinite

93. Hall voltage is directly proportional to

    A) Current   B) Electric field

    C) Magnetic flux density   D) All of above

94. Work done on an object to bring it to certain point in space is called

    A) Gravitational potential energy   B) Potential energy

    C) Kinetic energy   D) Mechanical energy

95. Point at which all rays converge is termed as

    A) Converging point   B) Focal point

    C) Focal center   D) Converging center

96. Which of the following is an amorphous material?

    A) Mica   B) Silver

    C) Lead   D) Glass

97. Compressive strength of grey cast iron in tonnes/cm is of the order of

    A) 35   B) 57

    C) 710   D) 1015

98. Which materials can be used to manufacture elastomers ?

    A) Limestone   B) Petroleum

    C) Alcohol   D) All of the above

99. Which among the following is known as Schmid's factor ?

    A) $(\cos^2 \alpha) \times (\cos^2 \beta)$ B) $(\cos \alpha) \times (\sin \beta)$

    C) $(\sin \alpha) \times (\sin \beta)$ D) $(\cos \alpha) \times (\cos \beta)$

100. What is meant by Frenkel defect ?

    A) Defect in which interstitial position is occupied by missing atoms

    B) Defect in which positive and negative ions are missing

    C) Defect in which interstitial position is occupied by extra atom in the crystal without disorganizing the parent atom

    D) None of the above

_____

SPACE FOR ROUGH WORK