

Seat No. \_\_\_\_\_

SUB: CHEMICAL ENGINEERING (CH)

Time: 1 Hour 30 minutes

**Instructions:**

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. Head developed by a centrifugal pump depends on its \_\_\_\_\_.  
A Diameter B Speed  
C Both A and B D None of these
2. The unit of heat transfer co-efficient in SI unit is \_\_\_\_\_.  
A  $W/m^2.K$  B  $W/m.K$   
C  $J/m^2.K$  D  $J/m.K$
3. Segmental baffles in a 2-4 shell and tube heat exchanger  
A change the flow pattern of the tube side fluid and increase the overall heat transfer coefficient. B increase the heat transfer coefficient in the shell side and support the tubes.  
C help to reduce the thermal expansion of the tubes and increase the heat transfer coefficient in the tube side. D increase the number of passes in the shell side and increase the heat transfer coefficient in the tube side.
4. The Reynolds number is defined as the ratio of the  
A inertial to viscous forces. B buoyancy to viscous forces.  
C buoyancy to inertial forces. D buoyancy to surface tension forces.
5. In a shell and tube heat exchanger, which is the best tube arrangement if the fluids are clean and non-fouling?  
A Triangular B Square  
C Rotated square D Rectangular
6. If air (a non-condensing gas) is present in a condensing vapor stream, it will \_\_\_\_\_ the condensation rate of vapor.  
A increase B increase the condensing film co-efficient as well as  
C not affect D decrease
7. Which characteristic of a fluid is not important in deciding its route in a shell and tube heat exchanger?  
A Corrosiveness B Fouling characteristic  
C Viscosity D None of these
8. Two tubes of diameters, 1 and 2 cms are filled with mercury to a height of 50 cm. Pressure at the bottom of the mercury column will be \_\_\_\_\_.  
A Higher for the tube of diameter 1 cm B Higher for the tube of diameter 2 cm  
C Same for both the tubes D Can't say. Data insufficient.
9. Minimum fluidisation velocity for a specific system depends upon the \_\_\_\_\_.  
A particle size B fluid viscosity  
C density of both the particle & the fluid D All A, B and C

10. Permanent pressure loss in a well designed venturi meter is about \_\_\_\_\_ percent of the venturi differential.  
 A 10 B 70  
 C 50 D 1
11. Potential flow is characterised by the \_\_\_\_\_.  
 A irrotational and frictional flow. B irrotational and frictionless flow.  
 C one in which dissipation of mechanical energy into heat occurs. D formation of eddies within the stream.
12. Assuming flow to be laminar, if the diameter of the pipe is halved, then the pressure drop will  
 A increase B decrease  
 C remain same D be quadrupled
13. With increase in the ratio of orifice diameter to pipe diameter, the fraction of the orifice pressure differential that is permanently lost  
 A increases B decreases  
 C remains unchanged D increases exponentially
14. The terminal velocity of a small sphere settling in a viscous fluid varies as the  
 A first power of its diameter. B inverse of the fluid viscosity.  
 C inverse square of the diameter. D square of the difference in specific weights of solid & fluid.
15. Maximum work that could be secured by expanding the gas over a given pressure range is the \_\_\_\_\_ work.  
 A isothermal B adiabatic  
 C isentropic D none of these
16. Work done is a \_\_\_\_\_.  
 A property of the system B path function  
 C state function D state description of a system
17. Extensive properties of a thermodynamic system depend upon the \_\_\_\_\_ of the system.  
 A specific volume B temperature  
 C mass D pressure
18.  $PV^\gamma = \text{Constant}$  (where,  $\gamma = C_p/C_v$ ) is valid for a/an \_\_\_\_\_ process.  
 A isothermal B isentropic  
 C isobaric D adiabatic
19. For an azeotropic mixture, the value of relative volatility will be  
 A 0 B 1  
 C Between 0 and 1 D  $>1$
20. Peclet number in heat transfer is  
 A Product of Reynolds and Prandtl number B Product of Reynolds and Nusselt number  
 C Product of Prandtl and Nusselt number D Product of Grashoff and Prandtl number
21. In a forced convection, the heat transfer depends on  
 A Re, Pr B Re, Gr  
 C Mainly Gr D Re only
22. With increase in porosity, the thermal conductivity of a solid substance  
 A increase B decrease  
 C remains unchanged D may increase or decrease; depends on the solids
23. The DCDA (Double Contact Double Adsorption) process is used for the manufacture of  
 A Urea B Sulphuric Acid.  
 C Nitric Acid D Ammonia

24. Critical Speed of a ball mill depends on  
 A the radius of the mill(shell) and the radius of the particles  
 B the radius of the mill(shell) and the density of the particles  
 C the radius of the balls and the radius of the particles  
 D the radius of the balls and the radius of the mill(shell)
25. Polyvinyl Chloride is produced by  
 A Co-polymerisation  
 B addition- type kinetics  
 C reacting chlorine with polyethylene  
 D reacting hydrochloric acid with polyethylene
26. Absorptivity of a perfect black body is equal to  
 A 0  
 B 1  
 C 0.5  
 D infinite
27. In constant pressure filtration, the rate of filtration follows the relation ( $V$  = filtrate volume,  $t$  = time,  $k$  and  $C$  = constants).  
 A  $\frac{dV}{dt} = kV + C$   
 B  $\frac{dV}{dt} = \frac{1}{kV + C}$   
 C  $\frac{dV}{dt} = kV$   
 D  $\frac{dV}{dt} = kV^2$
28. For a particle settling in water at its terminal settling velocity, which of the following is true?  
 A Buoyancy = Weight + Drag  
 B Weight = Buoyancy + Drag  
 C Drag = Buoyancy + Weight  
 D Drag = Weight
29. According to the penetration theory of mass transfer, the mass transfer coefficient ( $k$ ) varies with diffusion coefficient ( $D$ ) of the diffusing species as  
 A  $D$   
 B  $D^{-1/2}$   
 C  $D^{1/2}$   
 D  $D^{3/2}$
30. The Grashoff Number is  
 A Thermal diffusivity/Mass diffusivity  
 B Inertial force/Surface tension force  
 C Sensible heat/Latent heat  
 D Buoyancy force/Viscous force
31. An aqueous solution of 2.45% by weight  $H_2SO_4$  has a specific gravity of 1.011. The composition expressed in normality is  
 A 0.2500  
 B 0.2528  
 C 0.5000  
 D 0.5055
32. The number of degrees of freedom for an azeotropic mixture of ethanol and water in vapour-liquid equilibrium is  
 A 3  
 B 1  
 C 2  
 D 0
33. The molar composition of a gas is 10%  $H_2$ , 10%  $O_2$ , 30%  $CO_2$  and balance  $H_2O$ . If 50%  $H_2O$  condenses, the final mole percent of  $H_2$  in the gas on a dry basis will be:  
 A 10%  
 B 5%  
 C 18.18%  
 D 20%
34. The feed to a binary distillation column has 40 mol% vapour and 60 mol% liquid. Then, the slope of the  $q$ -line in the McCabe-Thiele plot is  
 A -1.5  
 B -0.6  
 C 0.6  
 D 1.5
35. In the sulphite process for paper manufacturing, the 'cooking liquor' is  
 A magnesium bisulphite and sulphur dioxide in acid medium  
 B magnesium sulphite and magnesium dicarbonate  
 C sodium sulphite and magnesium sulphite  
 D sodium sulphite and sodium bisulphite and sulphur dioxide

36. In Tyler series, the ratio of the aperture size of a screen to that of the next smaller screen is  
 A  $1/\sqrt{2}$  B  $\sqrt{2}$   
 C 1.5 D 2
37. 1 Kcal/kg°C is equivalent to \_\_\_\_\_ BTU/lb.°F.  
 A 1 B 2.42  
 C 4.97 D None of these
38. Rate of adsorption increases as the  
 A Temperature increases. B Temperature decreases.  
 C Pressure decreases. D None of these
39. Increase in reflux ratio always increases the \_\_\_\_\_ cost of the distillation column  
 A Operating cost B Fixed cost  
 C Both (A) and (B) D None of these
40. Fenske equation determines the  
 A maximum number of ideal plates. B height of the distillation column.  
 C minimum number of theoretical plates. D optimum reflux ratio.
41. Nitrile rubber is produced by the polymerisation of  
 A acrylonitrile & butadiene B acrylonitrile & styrene  
 C isobutylene & isoprene D none of these
42. In a fluidized bed reactor  
 A Temperature gradients are very high B Temperature is more or less uniform  
 C Hot spots formed D Segregation of solids occurs
43. Bollman extractor  
 A is a static bed leaching equipment B is used for extraction of oil from oilseed  
 C is a centrifugal extractor D employs only counter-current extraction
44. Prilling tower is found in the flow sheet for the manufacturing of  
 A Ammonia B Urea  
 C Superphosphate D Triple Superphosphate
45. An isothermal liquid phase zero order reaction  $A \rightarrow B$  ( $k = 0.5 \text{ mol/m}^3 \text{ s}$ ) is carried out in a batch reactor. The initial concentration of A is  $2 \text{ mol/m}^3$ . At 3 seconds from the start of the reaction, the concentration of A in  $\text{mol/m}^3$  is \_\_\_\_\_.  
 A 0.5 B 1  
 C 0.1 D 5
46. In order to achieve the same conversion under identical reaction conditions and feed flow rate for a non-autocatalytic reaction of positive order, the volume of an ideal CSTR is  
 A always greater than that of an ideal PFR B always smaller than that of an ideal PFR  
 C same as that of an ideal PFR D smaller than that of an ideal PFR only for first order reaction
47. Catalytic cracking is  
 A a hydrogen addition process B a carbon rejection process  
 C An exothermic process D A coking process
48. Reid vapour pressure of gasoline is the measure of its  
 A Pour point B Cloud point  
 C vapour locking tendency D Carbon residue

49. For an exothermic reversible reaction, which of the following correctly describes the dependence of the equilibrium constant(K) with temperature(T) and pressure(P)?  
 A K is independent of T and P      B K increases with an increase in T and P  
 C K increases with T and decreases with P      D K decreases with an increase T and is Independent of P
50. The exit age distribution of a fluid leaving a vessel is used to know the  
 A Activation energies of a reaction      B Reaction mechanism  
 C Extent of non-ideal flow in the vessels      D None of these
51. Response of a linear control system for a change in set point is called  
 A Frequency response      B Transient response  
 C Servo problem      D Regulator problem
52. For an input forcing function,  $X(t) = 2t^2$ , the laplace transform of this function is  
 A  $2/s^2$       B  $4/s^2$   
 C  $2/s^3$       D  $4/s^3$
53. In second order underdamped system  
 A Decay ratio = overshoot      B Decay ratio =  $(\text{overshoot})^2$   
 C Overshoot increases for increasing damping co-efficient.      D Large damping co-efficient means smaller damping.
54. Which is the most undesirable component in kerosene ?  
 A Aromatics      B i-paraffins  
 C n-paraffins      D Naphthenes
55. High Aniline point of Diesel indicates that, it  
 A Is highly aromatic      B Has a large ignition delay  
 C Is highly paraffinic      D Has a lower diesel index
56. Which is almost absent in crude petroleum?  
 A Olefins      B Mercaptans  
 C Naphthenes      D Cycloparaffins
57. Octane number of gasoline is a measure of its  
 A knocking tendency      B ignition delay  
 C ignition temperature      D smoke point
58. Half life of \_\_\_\_\_ order reaction does not depend upon concentration  
 A 0      B 2  
 C 1      D 3
59. Utilities cost in the operation of chemical process plant comes under the  
 A plant overhead cost      B Fixed charges  
 C Direct production cost      D General expenses
60. Which of the following relationship is not correct is case of a chemical process plant?  
 A Manufacturing cost = direct product cost + fixed charges + plant overhead costs      B General expenses = administrative expenses + distribution & marketing expenses  
 C Total product cost = manufacturing cost + general expenses      D Total product cost = direct production cost + plant overhead cost.
61. In a manufacturing industry, break even point occurs, when the

- A total annual rate of production equals the assigned value      B total annual product cost equals the total annual sales.  
 C annual profit equals the expected value.      D annual sales equals the fixed cost.
62. \_\_\_\_\_ taxes are based on gross earnings.  
 A Property      B Exice  
 C income      D Capital gain
63. Cost incurred towards \_\_\_\_\_ in a chemical plant is a component of the utilities cost.  
 A water supply      B running a control laboratory  
 C property protection      D Medical services
64. Catalytic action in a catalytic chemical reaction follows from the ability of catalyst to change the  
 A activation energy      B equilibrium constant  
 C heat of reaction      D None of these
65. An amplitude ratio of 0.1 corresponds to \_\_\_\_\_ decibels.  
 A 20      B -20  
 C 10      D -10
66. Presence of sulphur in gasoline  
 A leads to corrosion.      B increases lead susceptibility  
 C decreases gum formation.      D helps during stabilisation
67. Operating principle of cyclone separator is based on the action of \_\_\_\_\_ dust particles.  
 A diffusion of      B centrifugal force on  
 C gravitational force on      D electrostatic force on
68. Reinglemann chart is used for the measurement of the  
 A combustibles present in automobile exhaust      B smoke density from a chimney.  
 C exhaust gas density.      D flue gas temperature.
69. Threshold Limit Value (TLV) is the maximum allowable concentration (i.e. safe limit) of pollutants in air. Safe limit for SO<sub>2</sub> in air is \_\_\_\_\_ ppm  
 A 5      B 500  
 C 1000      D 2000
70. Gel point in Condensation polymerisation is used to express  
 A End of reaction      B Control of reaction rate  
 C Start of crosslinking      D Start of degradation
71. Examples for inorganic polymers are  
 A Silicone rubber and Polyphosphate      B Polygermane and Lignin  
 C Cellulose and Polypeptide      D Silicone rubber and Polypyrrole
72. Which type of white pigment is largely accepted in polymer industry?  
 A CaO      B CaCO<sub>3</sub>  
 C TiO<sub>2</sub>      D MgO
73. Nylon-6 is manufactured from

- A caprolactum. B adipic acid and hexamethylenediamine.  
C maleic anhydride and hexamethylenediamine. D sebacic acid and hexamethylenediamine
74. Buna-S is also known as  
A Teflon B PTFE  
C SBR D Polyacrylates
75. Which of the following is not a biopolymer?  
A protein B polysaccharide  
C polyurethane D RNA
76. Ziegler-Natta Catalyst is used to produce  
A Stereoregular Polymers B Branched Polymers  
C Copolymers D Amorphous Polymers
77. Which of the following polymers are condensation polymers?  
A Bakelite B Teflon  
C Butyl rubber D Amino resin
78. Function of baffles in a shell and tube heat exchanger \_\_\_\_\_.  
A To direct shell side fluid B To support tube bundle  
C To increase shell side heat transfer coefficient D All of the above
79. In general, strongest polymer group is \_\_\_\_\_.  
A Thermoplasts B Thermosets  
C Elastomers D All polymers
80. Expandable Polystyrene beads are produced by  
A Bulk Polymerisation B Interfacial Polymerisation  
C Plasma Polymerisation D Suspension Polymerisation
81. Improper integral  $\int_0^{\infty} \frac{dx}{x^2 + 1}$  is

A  $\frac{\pi}{2}$

B  $\frac{\pi}{3}$

C  $\frac{\pi}{4}$

D None of these.

82. Determine the saddle point of  $f(x, y) = x^2 - y^2 - 2x + 4y + 6$ .

A (1, 1)

B (-1, 1)

C  $(1, -1)$

D  $(1, 2)$

83. Find the derivative of the function  $f(x, y) = 2xy - 3y^2$  at  $P(5, 5)$  in the direction of

$$\vec{u} = 4\hat{i} + 3\hat{j}.$$

A  $-3$

B  $-4$

C  $3$

D  $4$

84. Evaluate  $\int_C x \, ds$  where  $C$  is the straight line segment  $x = t, y = t/2$ , from  $(0, 0)$

to  $(4, 2)$ .

A  $4$

B  $2$

C  $4\sqrt{5}$

D None of these

85. Determine the counterclockwise circulation of  $\vec{F} = (x - y)\hat{i} + (y - x)\hat{j}$  where  $C$  is

the square bounded by  $x = 0, x = 1, y = 0, y = 1$ .

A  $2$

B  $1$

C  $3$

D  $0$



86. General solution of  $12y'' - 5y' - 2y = 0$  is

A  $y = c_1 e^{2x/3} + c_2 e^{-x/4}$

B  $y = c_1 e^{2x/3} + c_2 e^{x/4}$

C  $y = c_1 e^{-2x/3} + c_2 e^{-x/4}$

D None of these

87. Determine the particular integral of  $y'' - 10y' + 25y = 30x + 3$

A  $y_p = \frac{6}{5}x - \frac{3}{5}$

B  $y_p = \frac{6}{5}x + 3$

C  $y_p = \frac{6}{5}x + \frac{3}{5}$

D None of these

88. Find the solution of  $x \frac{dy}{dx} + (3x + 1)y = e^{-3x}$ .

A  $y = e^{-3x} + c x^{-2} e^{-3x}$

B  $y = e^{3x} + c x^{-1} e^{-3x}$

C  $y = e^{-3x} + c x^{-1} e^{-3x}$

D None of these

89. The particular integral of  $y'' + y = \sec x$

A  $y_p = x \cos x \ln |\cos x|$

B  $y_p = \cos x \ln |\cos x|$

C  $y_p = \sin x \ln |\cos x|$

D None of these

90. The solution of  $x^2 y'' - 3xy' - 2y = 0$  is

A  $y = c_1 x^{(2-\sqrt{6})} + c_2 x^{(2+\sqrt{6})}$

B  $y = c_1 x^{(1-\sqrt{6})} + c_2 x^{(1+\sqrt{6})}$

C  $y = c_1 x^{(3-\sqrt{6})} + c_2 x^{(3+\sqrt{6})}$

D None of these

91. Let  $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$  then  $A^n =$

A  $\begin{bmatrix} 1 & 2n \\ 0 & n \end{bmatrix}$

B  $\begin{bmatrix} n & 2n \\ 0 & n \end{bmatrix}$

C  $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$

D  $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$

92. Find the eigen values of  $A = \begin{bmatrix} 2 & -1 \\ -2 & 3 \end{bmatrix}$ .

A  $2, -3$

B  $1, 4$

C  $-1, 4$

D None of these

93. Solve  $2x + 3y = 1, \quad 5x + 7y = 3$ .

A  $(x, y) = (-2, -1)$

B  $(x, y) = (2, 1)$

C  $(x, y) = (2, -1)$

D None of these

94. The function  $f(z) = \frac{z}{z+i}$  is not analytic at

A  $z = 0$

B  $z = -i$

C  $z = i$

D None of these

95. Evaluate  $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$  where  $C$  is the circle  $|z| = 3$ .

A  $2\pi i$

B  $4\pi i$

C  $-2\pi i$

D None of these

96. Choose correct option for the series of  $\csc z$ .

A  $\frac{1}{z} + \frac{z}{6} + \frac{7z^3}{360} + \dots$

B  $z + \frac{z^2}{6} + \frac{7z^3}{360} + \dots$

C  $\frac{1}{z} + \frac{z}{36} + \frac{7z^3}{360} + \dots$

D None of these

97. Find the probability that a single toss of a die will result in a number less than 4 if no other information is given.

A  $\frac{1}{6}$

B  $\frac{1}{3}$

C  $\frac{1}{4}$

D  $\frac{1}{2}$

98. Find the probability that in five tosses of a fair die, a 3 will at most once.

A  $\frac{625}{3625}$

B  $\frac{625}{3600}$

C  $\frac{3125}{3888}$

D  $\frac{315}{3625}$

99. Determine the interval where root lies for the function  $f(x) = x^3 - 2x^2 - 5$ .

A  $(-1, 0)$

B  $(2, 3)$

C  $(0, 1)$

D  $(1, 2)$

100. Choose appropriate formula of Simpson's Three - Eights rule for  $\int_{x_0}^{x_3} f(x) dx$ .

A  $\frac{3h}{8}[f(x_0) + 3f(x_1) + 3f(x_2) + f(x_3)]$       B  $\frac{3h}{8}[f(x_0) + 2f(x_1) + 2f(x_2) + f(x_3)]$

C  $\frac{3h}{2}[f(x_0) + 3f(x_1) + 3f(x_2) + f(x_3)]$       D  $\frac{h}{3}[f(x_0) + 3f(x_1) + 3f(x_2) + f(x_3)]$

Seat No. \_\_\_\_\_

**SUB: ELECTRICAL ENGINEERING (EE)**

**Time: 1 Hour 30 minutes**

**Instructions:**

- 1. Ensure that all pages are printed.**
- 2. Use Black ball pen only**
- 3. Change in option is not allowed**
- 4. There is no negative marking**
- 5. Use of non -programmable scientific calculator is allowed**

1. Schmitt trigger can be used as
  - (A) Flip flop
  - (B) Comparator
  - (C) Square wave generator
  - (D) All of these
2. A 1 mA ammeter has a resistance of 100 ohm. It is to be converted to a 1 A ammeter. The value of shunt resistance is
  - (A) 0.001 ohm
  - (B) 100 ohm
  - (C) 0.100 ohm
  - (D) 100000 ohm
3. For Op-Amps, the ratio of change in input offset voltage when variation in supply voltage is made is called
  - (A) PSRR
  - (B) CMRR
  - (C) Transient Response
  - (D) Input Offset voltage stability
4. In control system integrator is represented by
  - (A) s
  - (B) s<sup>2</sup>
  - (C) 1/s<sup>2</sup>
  - (D) 1/s
5. Four identical alternators each are rated for 20 MVA, 11 KV having a subtransient reactance of 16% are working in parallel. The short circuit level at the busbar is
  - (A) 500 MVA
  - (B) 400 MVA
  - (C) 125 MVA
  - (D) 100 MVA
6. In a dc machine 4 pole lap winding is used. The number of parallel paths is?
  - (A) 4
  - (B) 2
  - (C) 1
  - (D) 8
7. A starting torque of 40 Nm is developed in an induction motor by an auto transformer starter with a tapping of 30%. If the tapping of auto transformer is 60%, then what is the starting torque?
  - (A) 160 N-m
  - (B) 100 N-m
  - (C) 240 N-m
  - (D) 80 N-m
8. Specified quantities of slack bus are
  - (A) P and Q
  - (B) V and  $\delta$
  - (C) P and  $\delta$
  - (D) P and V
9. The BCD code of 38 is
  - (A) 00111000
  - (B) 10000010
  - (C) 10000100
  - (D) 10000011
10. In DC Machine, Which of the following are variable losses?
  - (A) eddy current loss
  - (B) hysteresis loss

- (C) shunt field copper loss (D) armature copper loss
11. A solid iron cylinder is placed in a region containing a uniform magnetic field such that the cylinder axis is parallel to the magnetic field direction. The magnetic field lines inside the cylinder will
    - (A) Bend farther away from the axis
    - (B) Bend closer to the cylinder axis
    - (C) Remain uniform as before
    - (D) Cease to exist inside the cylinder
  12. A Pelton wheel turbine having a rated speed of 300 rpm is connected to an alternator to produce power at 50 Hz. The number of poles required in the alternator is
    - (A) 4
    - (B) 20
    - (C) 8
    - (D) 10
  13. A 10 bit A/D converter is used to digitize an analog signal in the 0 to 5 V range. The maximum peak to peak ripple voltage that can be allowed in the dc supply voltage is
    - (A) Nearly 100 mV
    - (B) Nearly 50 mV
    - (C) Nearly 25 mV
    - (D) Nearly 5 mV
  14. Two identical first order systems have been cascaded non interactively. The unit step response of the system will be
    - (A) Overdamped
    - (B) Underdamped
    - (C) Critically damped
    - (D) Undamped
  15. Proximity effect is more in case of
    - (A) Power cables
    - (B) Overhead lines
    - (C) Same for both A & B
    - (D) None of the above
  16. Maxwell's divergence equation for the magnetic field is given by
    - (A)  $\nabla \times B = 0$
    - (B)  $\nabla \times B = \rho$
    - (C)  $\nabla \cdot B = 0$
    - (D)  $\nabla \cdot B = \rho$
  17. A second order control system has a transfer function  $16/(s^2 + 4s + 16)$ . Find the settling time for 2% tolerance?
    - (A) 10 sec
    - (B) 4 sec
    - (C) 5 sec
    - (D) 2 sec
  18. A transmission line has impedance of  $(0.005 + j0.05)$  pu. Find the line at which maximum value of negative DC off set current is produced, if it is applied with  $V_m \cos \omega t$ ?
    - (A) 4.68 msec
    - (B) 9.68
    - (C) 1.47 msec
    - (D) 2.63 msec
  19. Slip test is performed to determine
    - (A) slip
    - (B) direct axis reactance and quadrature axis reactance
    - (C) positive sequence reactance and negative sequence reactance
    - (D) all of the above
  20. Universal motor have which of the following application?
    - (A) Domestic pump.
    - (B) Food mixer.
    - (C) Traction.
    - (D) Lift.
  21. A 230 volt dc motor has an armature winding resistance of 0.5 ohm. Calculate the emf induced by the motor if the full load armature current is 23 ampere.
    - (A) 120 volt.
    - (B) 218.5 volt.
    - (C) 220.4 volt.
    - (D) None of these.
  22. In a commutation circuit employed to turn-off an SCR, satisfactory turn-off is obtained when
    - (A) Circuit turn-off time < device turn-off time
    - (B) Circuit turn-off time > device turn-off time

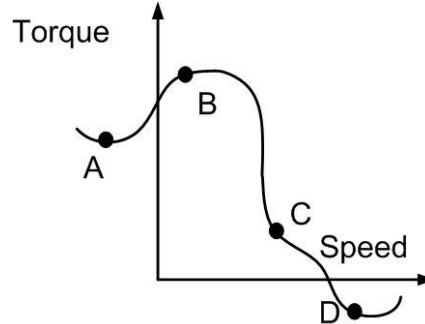
- (C) Circuit time constant > device turn-off time (D) Circuit time constant < device turn-off time
23. When a program is being executed in an 8085 microprocessor, its program counter contains
- (A) The number of instructions in the current program that have already been executed (B) The total number of instruction in the program being executed
- (C) The memory address of the instruction that is being currently executed (D) The memory address of the instructions that is to be executed next
24. Which type of connection is employed for current transformers for the protection of delta- star connected 3-phase transformer?
- (A) delta-delta (B) star-star  
(C) delta-star (D) star-delta
25. For emitter bias, the voltage at the emitter is 0.7 V less than the
- (A) Base voltage. (B) Emitter voltage.  
(C) Collector voltage (D) Ground voltage
26. Angle condition for complimentary root locus or inverse root locus is
- (A)  $\pm (2q + 1) 180^\circ$  (B)  $\pm (2q) 180^\circ$   
(C)  $\pm (2q + 1) 360^\circ$  (D)  $\pm (2q) 360^\circ$
27. For a stranded conductors, how to find the total number of strands (N) when number of layers (x) are given
- (A) Total number of strands  $N = 3x^2 + 3x + 1$  (B) Total number of strands  $N = 3x^2 - 3x - 1$   
(C) Total number of strands  $N = 3x^2 + 3x - 1$  (D) Total number of strands  $N = 3x^2 - 3x + 1$
28. The inductance of a long solenoid of length 1000 mm wound uniformly with 3000 turns on a cylindrical paper tube of 60 mm diameter is
- (A) 3.2  $\mu$ H (B) 3.2mH  
(C) 32.0mH (D) 3.2 H
29. The empty space between the plates of a capacitor is filled with a liquid of dielectric constant K. The capacitance of capacitor
- (A) Increases by a factor  $K^2$  (B) Decreases by a factor K  
(C) Increases by a factor K (D) Decreases by a factor  $K^2$
30. The frequency response of a linear system  $G(j\omega)$  is provided in the tabular form below.

$ G(j\omega) $	1.3	1.2	1.0	0.8	0.5	0.3
Angle $(G(j\omega))$	-130°	-140°	-150°	-160°	-180°	-200°

The gain margin and the phase margin of the system are

- (A) 6 dB and 30° (B) 6 dB and -30°  
(C) -6 dB and 30° (D) -6 dB and -30°
31. It is desirable to eliminate 5<sup>th</sup> harmonic voltage from the phase voltage of an alternator. The coils should be short pitched by an electrical angle of
- (A) 36° (B) 30°  
(C) 18° (D) 72°
32. DIAC and TRIAC both are semiconductor devices and conduct in

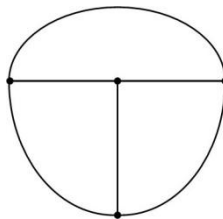
- (A) Both conducts in forward direction (B) DIAC conducts in forward direction and TRIAC conducts in reverse direction
- (C) Both conducts in reverse direction (D) Both conduct in either direction.
33. The number of comparisons carried out in a 4 bit flash-type A/D convertor is  
 (A) 16 (B) 15  
 (C) 4 (D) 3
34. On the torque speed curve of an Induction motor as shown in figure, four points of operation are marked as A, B, C and D



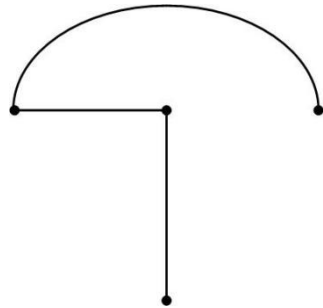
- Which one of them represents operation at a Slip greater than 1?  
 (A) D (B) C  
 (C) B (D) A
35. Which of the following rules determines the mapping of s-plane to z-plane?  
 (A) Right half of the s-plane maps into outside of the unit circle in z-plane (B) Left half of the s-plane maps into inside of the unit circle  
 (C) Imaginary axis in s-plane maps into the circumference of the unit circle (D) All of the above
36. AC to DC circulating current dual convertors are operated with the following relationship between their triggering angles ( $\alpha_1$  and  $\alpha_2$ )  
 (A)  $\alpha_1 + \alpha_2 = 180^\circ$  (B)  $\alpha_1 + \alpha_2 = 360^\circ$   
 (C)  $\alpha_1 - \alpha_2 = 180^\circ$  (D)  $\alpha_1 + \alpha_2 = 90^\circ$
37. A stationary closed Lissajous pattern on an oscilloscope has 3 horizontal tangencies and 2 vertical tangencies for a horizontal input with frequency 3 kHz. The frequency of the vertical input is  
 (A) 1.5 kHz (B) 2 kHz  
 (C) 3 kHz (D) 4.5 kHz
38. An op-amp has an open-loop gain of  $10^5$  and an open loop upper cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut-off frequency is  
 (A) 10 kHz (B) 100 Hz  
 (C) 10 kHz (D) 100 kHz
39. With regard to filtering property, the lead compensator is  
 (A) Low pass filter (B) band pass filter  
 (C) high pass filter (D) band reject filter



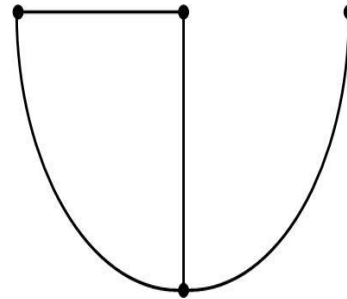
40. A single phase transformer has no-load loss of 64 W, as obtained from an open-circuit test. When a short-circuit test is performed on it with 90% of the rated currents flowing in its both LV and HV windings, the measured loss is 81W. The transformer has maximum efficiency when operated at
- (A) 50.0% of the rated current (B) 64.0% of the rated current  
(C) 80.0% of the rated current (D) 88.8% of the rated current
41. Circuit turn-off time of an SCR is defined as the time
- (A) Taken by the SCR to turn off (B) Required for the SCR current to become zero  
(C) For which the SCR is reverse biased by the commutation circuit (D) For which the SCR is reverse biased to reduce its current below the holding current.
42. The equivalent circuit of a transformer has leakage reactances  $X_1$ ,  $X'_2$  and magnetizing reactance  $X_M$ , their magnitudes satisfy
- (A)  $X_1 \gg X'_2 \gg X_M$  (B)  $X_1 \ll X'_2 \ll X_M$   
(C)  $X_1 \approx X'_2 \gg X_M$  (D)  $X_1 \approx X'_2 \ll X_M$
43. Two capacitors of capacitances 3  $\mu\text{F}$  and 6  $\mu\text{F}$  in series will have a total capacitance of
- (A) 9  $\mu\text{F}$  (B) 2  $\mu\text{F}$   
(C) 18  $\mu\text{F}$  (D) 24  $\mu\text{F}$
44. When a unit ramp input is applied to the unity feedback system having closed loop transfer function,  $C(s) / R(s) = (Ks+b) / (s^2 + as + b)$ ; ( $a>0$ ,  $b>0$ ,  $K>0$ ), the steady state error will be
- (A) 0 (B)  $a/b$   
(C)  $(a + K)/b$  (D)  $(a-K) / b$
45. A 500 kVA, 3 phase transformer has iron losses of 300 W and full load copper losses of 600 W. The percentage load at which the transformer is expected to have maximum efficiency is
- (A) 50.0% (B) 70.7%  
(C) 141.4% (D) 100%
46. Consider the network graph shown in the figure. Which one of the following is NOT a 'tree' of this graph?



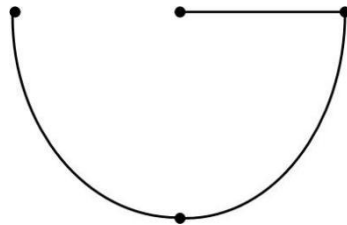
(A)



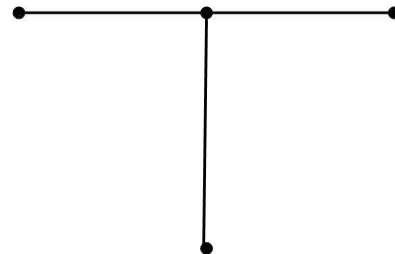
(B)



(C)

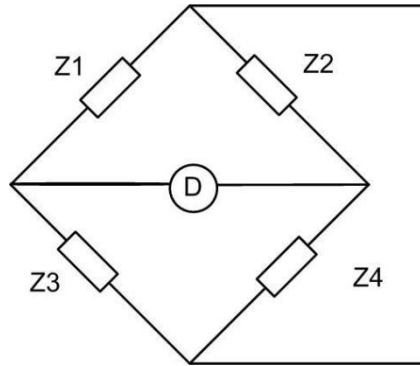


(D)



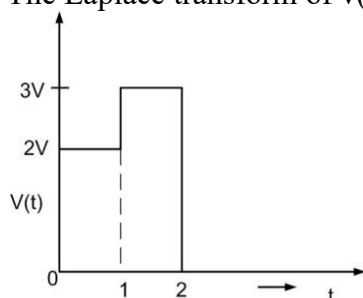
47. When a junction diode is Reverse Biased then diode acts like .....
- (A) Short switch (B) Close switch  
(C) An open switch (D) None of the above
48. The feedback factor of a Wien bridge oscillator using Op-Amp is
- (A)  $\frac{1}{3}$  (B)  $\frac{1}{4}$   
(C)  $\frac{1}{2}$  (D) 1
49. The total harmonic distortion (THD) of ac supply input current of rectifiers is maximum for
- (A) Single phase diode rectifier with DC inductive filter (B) 3 Phase diode rectifier with dc inductive filter  
(C) 3 phase thyristor rectifier with inductive filter (D) Single phase diode rectifier with capacitive filter
50. The bridge method commonly used for finding mutual inductance is
- (A) Heaviside Campbell Bridge (B) Schering Bridge  
(C) De Sauty Bridge (D) Wein Bridge
51. Which of the following will take least time in starting from cold condition to full load operation
- (A) Gas turbine plant. (B) Nuclear power plant.  
(C) Hydroelectric power plant. (D) Thermal power plant.
52. The function of snubber circuit connected across the [SCR](#) is to
- (A) Suppress  $dV / dt$ . (B) Increase  $dV / dt$ .  
(C) Decrease  $di / dt$ . (D) All of the above
53. A galvanometer with a full scale current of 10 mA has a resistance of 1000  $\Omega$ . The multiplying power (the ratio of measured current to galvanometer current) of 100  $\Omega$  shunt with this galvanometer is
- (A) 110 (B) 11

- (C) 100 (D) 10
54. A six pulse thyristor rectifier bridge is connected to a balanced 50 Hz three phase ac source. Assuming that the DC output current of the rectifier is constant. The lowest frequency harmonics component of the ac source line current is
- (A) 100 Hz (B) 150 Hz  
(C) 250 Hz (D) 300 Hz
55. In figure,  $Z_1 = 200\angle 60^\circ$  ohm,  $Z_2 = 400\angle -90^\circ$  ohm,  $Z_3 = 300\angle 0^\circ$  ohm. Then  $Z_4$  for bridge to be balanced is



- (A)  $400\angle -90^\circ$  ohm. (B)  $150\angle 30^\circ$  ohm.  
(C)  $600\angle -150^\circ$  ohm. (D)  $300\angle 90^\circ$  ohm.
56. Which of the following factor does not contribute to decide right of way (R-O-W) for transmission line
- (A) Electric field (B) Audible noise  
(C) Insulating material of isolator string (D) Radio interference
57. A sinusoidal signal waveform, when observed on an oscilloscope, has a peak to peak amplitude of 6 cm. If the vertical sensitivity setting is 5 v/cm, then rms value of the voltage will be
- (A) 15V (B) 12.6V  
(C) 11.1V (D) 10.6V
58. The thermal, nuclear and hydro power plant alternators should have following speeds respectively
- (A) 3000, 2000, 1000 (B) 3000, 3000, 300  
(C) 1000, 2000, 3000 (D) 3000, 300, 300
59. To increase Q factor of a coil, the wire should be
- (A) Thick (B) Thin  
(C) Long (D) Long and thin
60. A 3 phase balanced load which has a power factor of 0.707 is connected to a balanced supply. The power consumed by the load is 5 kW. The power is measured by the two- wattmeter method. The readings of the two wattmeters are
- (A) 3.94 kW and 1.06 kW (B) 2.50 kW and 2.50 kW  
(C) 5.00 kW and 0.00 kW (D) 2.96 kW and 2.04 kW
61. The instrument transformers are known to introduce magnitude and phase errors in measurements. These are primarily due to
- (A) Improper connections on the primary side (B) Measurement errors inherent in the meter connected to the transformer secondary

- (C) Open and short-circuit parameters of the instrument transformers (D) None of these.
62. The maximum percentage error in the sum of two voltage measurements when  $V_1 = 100V \pm 1\%$  and  $V_2 = 80V \pm 5\%$  is  
 (A)  $\pm 4\%$  (B)  $\pm 2.8\%$   
 (C)  $\pm 6\%$  (D)  $\pm 3\%$
63. An overhead line having a surge impedance of 400 ohm is connected in series with an underground cable having a surge impedance of 100 ohm. If a surge of 50 kV travels from the line towards the cable junctions, the value of the transmitted voltage wave at the junction is  
 (A) 30 kV (B) 20 kV  
 (C) 80 kV (D) -30 kV
64. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is  
 (A) 16 Kbytes (B) 32 Kbytes  
 (C) 48 Kbytes (D) 64 Kbytes
65. In an inverse definite minimum time electromagnetic type over-current relay, the minimum time feature is achieved because of  
 (A) Saturation of the magnetic circuit (B) Proper mechanical design  
 (C) Appropriate time delay element (D) Electromagnetic Damping
66. In a residential electrical connection having load less than 5 kW, the following rating of leakage current for ELCB is suggested  
 (A) 300 mA (B) 30 mA  
 (C) 3 mA (D) 3000 mA
67. In a thyristor dc chopper, which type of commutation results in best performance?  
 (A) Voltage Commutation (B) Current commutation  
 (C) Load Commutation (D) Supply Commutation
68. The Laplace transform of  $v(t)$  in the figure is



- (A)  $\frac{v}{s}e^{-s} - \frac{3v}{s}e^{-2s}$  (B)  $\frac{2v}{s} - \frac{3v}{s}e^{-2s}$   
 (C)  $\frac{2v}{s} + \frac{v}{s}e^{-s}$  (D)  $\frac{2v}{s} + \frac{v}{s}e^{-s} - \frac{3v}{s}e^{-2s}$
69. A Power system consists of 300 buses out of which 20 buses are generator bus, 25 buses are ones with reactive power support and 15 buses are the ones with fixed shunt capacitors. All the other buses are load buses. It is proposed to perform a load flow analysis in the system using NEWTON RAPHSON Method. The size of Newton Raphson Jacobian Matrix is  
 (A)  $553 \times 553$  (B)  $540 \times 540$

- (C)  $555 \times 555$  (D)  $554 \times 554$

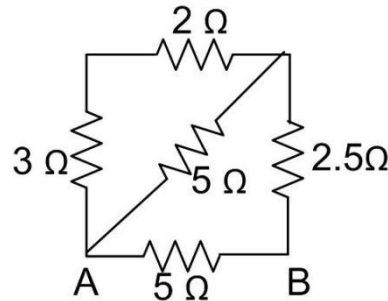
70. A unity feedback system has the open loop transfer function

$$G(s) = \frac{1}{(s-1)(s+2)(s+3)}$$

The Nyquist Plot of  $G(s)$  encircles the origin

- (A) Never (B) Once  
(C) Twice (D) Thrice
71. What should be the power factor for an Ideal Inductor?
- (A) Unity (B) Zero  
(C) 0.707 (D) 0.5
72. The dissipation factor of a good dielectric is of the order of
- (A) 0.0002 (B) 0.02  
(C) 0.1 (D) 1
73. The desirable properties of transformer core material are
- (A) Low permeability and low hysteresis loss (B) High permeability and low hysteresis loss  
(C) High permeability and high hysteresis loss (D) Low permeability and high hysteresis loss
74. A shunt-connected DC Motor operates at its rated terminal voltage. Its no-load speed is 200 radian/second. At its rated torque of 500 Nm, its speed is 180 radian/second. The motor is used to directly drive a load whose load torque  $T_L$  depends on its rotational speed  $\omega_r$  (in radian/second), such that  $T_L = 2.78 \times \omega_r$ . Neglecting rotational losses, the steady-state speed (in radian/second) of the motor, when it drives this load is approximately equal to
- (A) 180 (B) 90  
(C) 135 (D) 225
75. The BCD code for a decimal number  $(874)_{10}$  is
- (A)  $(100001110100)_{BCD}$  (B)  $(010001111000)_{BCD}$   
(C)  $(100001000111)_{BCD}$  (D)  $(011110000100)_{BCD}$
76. Bundled conductors are mainly used in high voltage overhead transmission lines to
- (A) Reduce transmission line losses (B) Increase mechanical strength of the line  
(C) Reduce corona (D) Reduce sag
77. A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
- (A) An AND gate (B) An OR gate  
(C) An XOR gate (D) An NAND gate
78. A 4 pole induction machine is working as an induction generator. The generator supply frequency is 60 Hz. The rotor current frequency is 5 Hz. The mechanical speed of the rotor in rpm is

- (A) 1350 (B) 1650  
(C) 1950 (D) 2250
79. Supply to one terminal of Delta-Star connected three-phase core type transformer which is on no-load fails. Assuming magnetic-circuit symmetry, voltages on the secondary sides will be  
(A) 230, 230, 115 (B) 345, 0, 345  
(C) 345, 115, 115 (D) 230, 115, 115
80. Five resistances are connected as shown in figure below. The equivalent resistance between the points A and B will be



- (A) 2.5 ohms (B) 10 ohms  
(C) 5 ohms (D) 15 ohms
81. Improper integral  $\int_0^1 \frac{dx}{\sqrt{1-x^2}}$  is  
A  $\frac{\pi}{3}$  B  $\frac{\pi}{2}$   
C  $\frac{\pi}{4}$  D  $2\pi$
82. Determine the saddle point of  $x^2 + xy + 3x + 2y + 5$ .  
A  $(-2, 1)$  B  $(-2, -1)$   
C  $(-2, 2)$  D None of these.
83. Find the derivative of the function  $f(x, y) = 3e^x \cos(yz)$  at  $P(0, 0, 0)$  in the direction of  $\vec{u} = 2\hat{i} + \hat{j} - 2\hat{k}$ .  
A 3 B 4  
C 2 D None of these.
84. Evaluate  $\int_C (x+y) ds$  where  $C$  is the straight line segment  $x=t, y=(1-t), z=0$  from  $(0, 1, 0)$  to  $(1, 0, 0)$ .  
A 2 B 1

- C 3 D None of these.
85. Evaluate  $\oint_C ((6y+x) dx + (y+2x) dy)$  where  $C$  is the circle  $(x-2)^2 + (y-3)^2 = 4$ .
- A 0 B  $16\pi$   
C  $-16\pi$  D None of these
86. General solution of  $4y'' + y' = 0$  is
- A  $y = c_1 + c_2 e^{-x/4}$  B  $y = c_1 + c_2 e^{-x/2}$   
C  $y = c_1 + c_2 e^{-x}$  D None of these
87. Determine the particular integral of  $y'' - y' + \frac{1}{4}y = 3 + e^{x/2}$
- A  $y_p = 12 + \frac{1}{2}x^2 e^{x/2}$  B  $y_p = 6 + \frac{1}{2}x^2 e^{x/2}$   
C  $y_p = 12 + \frac{1}{2}e^{x/2}$  D None of these
88. Find the solution of  $\cos x \frac{dy}{dx} + (\sin x)y = 1$ .
- A  $y = \cos x + c \sin x$  B  $y = \sin x + c \cos x$   
C  $y = 2 \sin x + c \cos x$  D None of these
89. The particular integral of  $y'' - y = \cosh x$
- A  $y_p = \frac{1}{2}x \cosh x$  B  $y_p = \frac{1}{2}x \sin x$   
C  $y_p = \frac{1}{2}x \sinh x$  D None of these
90. The solution of  $x^2 y'' - 2y = 0$  is
- A  $y = c_1 x^{-2} + c_2 x^2$  B  $y = c_1 x^{-2} + c_2 x^3$   
C  $y = c_1 x + c_2 x^2$  D None of these
91. Let  $A = \begin{bmatrix} 5 & 2 \\ 0 & k \end{bmatrix}$ . Find the number  $k$  such that  $A$  is the root of the polynomial  $f(x) = x^2 - 25$ .
- A 2 B 3  
C 4 D None of these
92. Find the eigen values of  $A = \begin{bmatrix} 2 & -3 \\ 2 & -5 \end{bmatrix}$ .
- A 1, -4 B 1, -1  
C 2 -1 D 2 -4
93. Solve  $2x - 4y = 10$ ,  $3x - 6y = 15$ .
- A  $(3 + 2a, a)$  where  $a \in R$  B  $(5 + 2a, a)$  where  $a \in R$

- C  $(5 + a, a)$  where  $a \in R$  D None of these
94. Find the derivative of  $f(z) = 3z^2 + 4iz - 5 + i$  at  $z = 2$ .  
 A  $3 + 4i$  B  $9 + 4i$   
 C  $12 + 4i$  D  $-3 + 4i$
95. Evaluate  $\oint_C \frac{e^z}{(z^2 + \pi^2)^2} dz$  where  $C$  is the circle  $|z| = 4$ .  
 A  $\frac{4i}{\pi}$  B  $\frac{i}{\pi}$   
 C  $\frac{2i}{\pi}$  D None of these
96. Choose correct option for the series of  $\coth z$ .  
 A  $\frac{1}{z} + \frac{z}{3} - \frac{z^3}{45} + \dots$  B  $\frac{1}{z} + \frac{z}{2} - \frac{z^3}{45} + \dots$   
 C  $\frac{1}{z} + \frac{z}{3} - \frac{z^3}{15} + \dots$  D None of these
97. A card is drawn at random from an ordinary deck of 52 playing cards. Find the probability that it is any suit except hearts.  
 A  $\frac{1}{2}$  B  $\frac{1}{13}$   
 C  $\frac{1}{4}$  D  $\frac{3}{4}$
98. Find the probability that in tossing a fair coin three times, there will appear 3 heads.  
 A  $\frac{1}{2}$  B  $\frac{1}{3}$   
 C  $\frac{1}{8}$  D  $\frac{2}{3}$
99. Determine the interval where root lies for the function  $f(x) = x^4 + 2x^2 - x - 3$ .  
 A  $(0, 1)$  B  $(1, 2)$   
 C  $(2, 3)$  D None of these
100. Which one is not the formula for numerical integration?  
 A False position method B Trapezoidal Rule  
 C Simpson's One-Third rule D Simpson's Three-Eighths rule

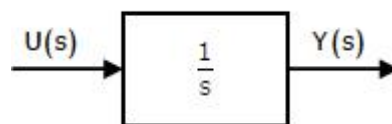




- C On the right half D Random

  11. A silicon  $p$ - $n$  junction at  $T = 300$  K has  $N_D = 10^{14} \text{ cm}^{-3}$  and  $N_A = 10^{17} \text{ cm}^{-3}$ . The built-in voltage is  
 A 0.63 V B 0.93 V  
 C 0.026 V D 0.038 V
  12. In unbiased  $p$ - $n$  junction, the junction current at equilibrium is  
 A due to diffusion of majority carriers B due to diffusion of minority carriers  
 C zero due to equal and opposite currents crossing the junction D zero because no charges cross the junction
  13.  $I_{dc}$  value for the half wave rectifier circuit can be given by  
 A  $\frac{I_m}{2}$  B  $\frac{I_m}{\sqrt{2}}$   
 C  $\frac{I_m}{\pi}$  D  $\frac{2I_m}{\pi}$
  14. A Tunnel diode is  $p$ - $n$  diode with  
 A very high doping in  $p$ -region B very high doping in  $n$ -region  
 C very high doping in both  $p$ -region and  $n$ -region D low doping in both  $p$ -region and  $n$ -region
  15. In a Varactor diode using the alloy junction, the transition capacitance is proportional to (where  $V_j$  is the magnitude of reverse junction voltage)  
 A  $V_j^2$  B  $\frac{1}{V_j}$   
 C  $\frac{1}{\sqrt{V_j}}$  D  $\frac{1}{V_j^2}$
  16. Main drawback of a JFET is  
 A high input impedance B low input impedance  
 C higher noise D lower gain
  17. A transition region in an open circuited  $p$ - $n$  junction contains  
 A Electrons only B Immobile ions  
 C Holes only D Electrons and holes both
  18. In a second order system, if the damping ratio is greater than equal to '1', then what would be the nature of roots?  
 A Imaginary B Real and equal  
 C Real but not equal D Complex conjugate
  19. The  $V$ - $I$  characteristics of an enhancement mode MOSFET has  
 A only an ohmic region B only a saturation region  
 C an ohmic region at low voltages and saturation region at higher voltages D an ohmic region at higher voltages and saturation region at lower voltages
  20. The Threshold Voltage ( $V_T$ ) of a  $n$ -MOSFET can be increased by  
 A increasing the channel dopant concentration B decreasing the channel dopant concentration  
 C reducing the gate oxide thickness D reducing the channel length
  21. Which point on root locus specifies the meeting or collision of two poles?  
 A Centroid B Break away point  
 C Stability point D Anti-break point

22. Which one of the following statements is NOT TRUE for a continuous time causal and stable LTI system?
- A All the poles of the system must lie on the left side of the  $j\omega$  axis      B Zeros of the system can lie anywhere in the s-plane
- C All the poles must lie within  $|s| = 1$       D All the roots of the characteristic equation must be located on the left side of the  $j\omega$  axis
23. Which of the following amplifier produces least distortion
- A Class-A      B Class-B
- C Class-C      D Class-AB
24. When multistage amplifier the coupling method which is capable of providing highest gain is
- A RC coupling      B Direct coupling
- C Transformer coupling      D Impedance coupling
25. In a feedback amplifier, de-sensitivity  $D$  equals
- A  $A\beta$       B  $1 + A\beta$
- C  $1 - A\beta$       D  $\frac{1}{1 + A\beta}$
26. Following compensation method in amplifier leads to reduction in bandwidth
- A Lead compensation      B Pole-zero compensation
- C Miller effect compensation      D Dominant pole compensation
27. Comparator circuits are used in
- A summing      B integrating
- C differentiating      D converting sine to square wave
28. The  $T_{on}$  time for the 555 based astable multivibrator is
- A  $0.69 (R_A + 2R_B).C$       B  $0.69 (R_A + R_B).C$
- C  $0.69 R_B.C$       D  $1.44R_B.C$
29. Common collector amplifier has (where  $R_i$  is input resistance and  $R_o$  is output resistance)
- A high  $R_i$  and high  $R_o$       B low  $R_i$  and low  $R_o$
- C high  $R_i$  and low  $R_o$       D low  $R_i$  and high  $R_o$
30. Assuming zero initial condition, the response  $y(t)$  of the system given below to a unit step input  $u(t)$  is



- A  $u(t)$       B  $tu(t)$
- C  $(t^2/2)u(t)$       D  $e^{-t}u(t)$
31. In 1-to-4 demultiplexer, how many select lines are required?
- A 1      B 2
- C 3      D 4
32. In which of the following base systems, 123 is not a valid number?
- A Base 10      B Base 7
- C Base 4      D Base 3

33. Binary equivalent of decimal 21.125 is  
 A 10101.001 B 11010.101  
 C 10001.101 D 01011.001
34. A debouncing circuit is  
 A an astable multivibrator B a bistable multivibrator  
 C a latch D a monostable multivibrator
35. Excess-3 code is known as  
 A weighted code B cyclic redundancy code  
 C self-complementing code D algebraic code
36. Which components play a significant role in the formation of a dynamic RAM?  
 A Two MOSFETs B Two capacitors  
 C One capacitor & two MOSFETs D One capacitor & one MOSFET
37. Which among the following is not a mode of Flip Flop representation?  
 A Characteristic equations B Excitation Tables  
 C Finite State Machines (FSM) D Variable Entered Mapping (VEM)
38. If the output of two-bit asynchronous binary up counter using T flip flops is '00' at reset condition, then what output will be generated after the fourth negative clock edge?  
 A 00 B 01  
 C 10 D 11
39. For a ring counter, the number of output states are always equal to  
 A Number of input states B Number of clock pulses  
 C Number of registers D Number of flip flops
40. For high speed applications, the preferable bipolar logic family is  
 A Diode Transistor Logic (DTL) B Transistor Transistor Logic (TTL)  
 C Emitter Coupled Logic (ECL) D Integrated Injection Logic (I<sup>2</sup>L)
41. If the quarter line is short-circuited, then it acts as  
 A Conductor B Insulator  
 C Capacitor D Inductor
42. After what wavelength does the nature of graph get reversed for the input impedance of open-circuited line?  
 A  $\lambda/2$  B  $\lambda/4$   
 C  $\lambda$  D  $\lambda/8$
43. To find a projection of one vector on to the other which of the following methods used  
 A Summation B Cross product  
 C Dot product D All of the above
44. The ratio of magnitudes of electric field intensity to the magnetic field intensity is regarded as  
 A Intrinsic Impedance B Characteristic Impedance  
 C Both A and B D None of the above
45. The constant x-circles of Smith chart becomes smaller due to increase in the value of 'x' from  
 A 0 to  $\pi$  B 0 to  $2\pi$   
 C 0 to  $\pi/2$  D 0 to  $\infty$
46. Which form of Gauss's law is regarded as Maxwell's first equation?  
 A Line form B Point form  
 C Angular form D Volume form
47. The correct relationship between electric field intensity (E) of two charges and their

B E inversely varies with r

D None of the above

48. Which conversion mechanism is performed by parabolic reflector antenna?  
A Plane to spherical wave  
B Spherical to plane wave  
C Both A and B  
D None of the above
49. Which type of wire antennas are also known as dipoles?  
A Linear  
B Loop  
C Helical  
D All of the above
50. Which mode of propagation is adopted in HF antennas?  
A Ionospheric  
B Ground wave  
C Tropospheric  
D All of the above
51. The sampling technique having the minimum noise interference is  
A Instantaneous sampling  
B Natural sampling  
C Flat top sampling  
D All of the above
52. Calculate the Nyquist rate for sampling when a continuous time signal is given by  $x(t) = 5 \cos 100\pi t + 10 \cos 200\pi t - 15 \cos 300\pi t$   
A 300 Hz  
B 600 Hz  
C 200 Hz  
D 100 Hz
53. Noise Factor(F) and Noise Figure(NF) are related as  
A  $NF = 10 \log_{10}(F)$   
B  $F = 10 \log_{10}(NF)$   
C  $NF = 10 (F)$   
D  $F = 10 (NF)$
54. Determine the Bandwidth of a FM wave when the maximum deviation allowed is 75KHz and the modulating signal has a frequency of 10KHz.  
A 170 kHz  
B 200 kHz  
C 210 kHz  
D 180 kHz
55. For a FM signal  $v(t) = 25 \cos (15 * 10^8 t + 10 \sin 1550t)$ , calculate Modulation index and Maximum frequency deviation  
A 10, 3000.1 Hz  
B 20, 1550.9 Hz  
C 10, 2465.9 Hz  
D 10, 2000.0 Hz
56. Phase-locked loop (PLL) circuit can be used as  
A FM demodulator  
B AM demodulator  
C FM receiver  
D AM receiver
57. In radio receivers, varactor diodes are used for  
A Tuning  
B Demodulation  
C Mixing  
D None of the above
58. QPSK is a modulation scheme where each symbol consists of  
A 1 bit  
B 2 bits  
C 4 bits  
D 8 bits
59. The capacity of Gaussian channel is  
A  $C = 2B(1+S/N)$  bits/s  
B  $C = B^2(1+S/N)$  bits/s  
C  $C = B(1+S/N)$  bits/s  
D  $C = B(1+S/N)^2$  bits/s
60. The digital modulation technique in which the step size is varied according to the variation in the slope of the input is called  
A Delta modulation  
B PCM  
C Adaptive Delta modulation  
D PAM
61. The noise that affects PCM  
A Transmission Noise  
B Quantization noise  
C Transit noise  
D Both A and B are correct

62. Entropy of a signal is  
 A Average information per message      B Mean squared error in a message  
 C Quantized information in a message      D None of the above
63. In digital transmission, the modulation technique that requires minimum bandwidth is  
 A Delta Modulation      B PCM  
 C DPCM      D PAM
64. For the mixer circuits in communication which of the following device is preferable?  
 A Varactor Diode      B BJT  
 C Tunnel diode      D FET
65. Transducers can be capable of  
 A Converting physical variations into electrical signal and vice versa      B Converting physical variations into electrical signal  
 C Converting electrical signal to physical variations      D None of the above
66. Which method determines the dispersion limitation of an optical link?  
 A Link power budget      B Rise time budget  
 C Both A and B      D None of the above
67. Which among the following is a key process adopted for the laser beam formation as it undergoes the light amplification?  
 A Spontaneous Emission      B Stimulated Emission  
 C Both A and B      D None of the above
68. In an optical fiber, the concept of Numerical aperture is applicable in describing the ability of  
 A Light Collection      B Light Scattering  
 C Light Dispersion      D Light Polarization
69. Which among the following is provided by an optical receiver for the regeneration of data signal with minimum error?  
 A Photo-diode      B Signal Processing Circuits  
 C Linear Circuitry      D None of the above
70. Discrete Fourier Transform (DFT) is applied to  
 A Infinite sequences      B Finite discrete sequences  
 C Continuous infinite signals      D Continuous finite sequences
71. Superposition of signals in a linear system refers to the  
 A Output that is product of all the signals      B Output that is sum of all the signals  
 C Output that is of highest amplitude of all the signals      D Output that is of largest spectrum of all the signals
72. The condition for a system to be causal is  
 A All poles of its transfer function must be left half of s-plane      B All poles of its transfer function must be right half of s-plane  
 C All zeros of its transfer function must be right half of s-plane      D All zeros of its transfer function must be left half of s-plane
73. The circular convolution of two sequences in time domain is equivalent to  
 A Multiplication of DFTs of two sequences      B Summation of DFTs of two sequences  
 C Difference of DFTs of two sequences      D Square of multiplication of DFTs of two sequences

74. Causal systems are the systems in which
- |   |   |
|---|---|
| A The output of the system depends on the present and the past inputs | B The output of the system depends only on the present inputs                           |
| C The output of the system depends only on the past inputs            | D The output of the system depends on the present input as well as the previous outputs |
75. Which flags represent the least significant bit (LSB) and most significant bit (MSB) of Program Status Word (PSW) respectively in 8051 microcontroller?
- |                              |                                      |
|------------------------------|--------------------------------------|
| A Parity Flag & Carry Flag   | B Parity Flag & Auxiliary Carry Flag |
| C Carry Flag & Overflow Flag | D Carry Flag & Auxiliary Carry Flag  |
76. What is the default value of stack once after the system undergoes the reset condition in 8051 microcontroller?
- |        |        |
|--------|--------|
| A 00 H | B 07 H |
| C 08 H | D 09 H |
77. Which of the following statements for 8085 is correct?
- |   |  |
|---|--|
| A Program Counter (PC) specifies the address of the instruction last executed | B PC specifies the address of the instruction being executed |
| C PC specifies the address of the instruction to be executed                  | D PC specifies the number of instructions executed so far    |
78. Processor status word of 8085 microprocessor has five flags. They are
- |                   |                    |
|-------------------|--------------------|
| A S, Z, AC, P, CY | B S, OV, AC, P, CY |
| C S, Z, OV, P, CY | D S, Z, AC, P, OV  |
79. Which of the following instruction is not possible in 8085?
- |           |            |
|-----------|------------|
| A POP PSW | B POP B    |
| C POP D   | D POP 30 H |
80. Which instruction is required to rotate the content of accumulator one bit right along with carry in 8085 microprocessor?
- |       |       |
|-------|-------|
| A RLC | B RAL |
| C RRC | D RAR |
81. Improper integral  $\int_0^1 \frac{dx}{\sqrt{x}}$  is
- |     |     |
|-----|-----|
| A 1 | B 2 |
| C 3 | D 0 |
82. At which point the local minima will occur?

$$f(x, y) = 2x^2 + 3xy + 4y^2 - 5x + 2y$$

A  $\left(3, \frac{3}{2}\right)$

B  $(3, -1)$

C  $(2, -1)$

D None of these.

83. Find the derivative of the function  $f(x, y) = \frac{x-y}{xy+2}$  at  $P(1, -1)$  in the direction of

$$\bar{u} = 12\hat{i} + 5\hat{j}.$$

A  $\frac{21}{13}$

B  $\frac{11}{13}$

C 0

D None of these

84. Evaluate  $\int_C (x + y + z) ds$  where  $C$  is the straight line segment from  $(1, 2, 3)$  to

$$(0, -1, 1).$$

A  $\sqrt{14}$

B 1

C  $3\sqrt{14}$

D None of these

85. Determine the counterclockwise circulation of  $\bar{F} = (y^2 - x^2)\hat{i} + (x^2 + y^2)\hat{j}$  where



$C$  is the triangle bounded by  $y = 0$ ,  $x = 3$ ,  $y = x$ .

A    3

B    9

C    18

D    None of these

86. General solution of  $y'' + 8y' + 16y = 0$  is

A     $y = c_1 \cos 4x + c_2 \sin 4x$

B     $y = c_1 \cos x + c_2 \sin x$

C     $y = c_1 \cos 3x + c_2 \sin 3x$

D    None of these

87. Determine the particular integral of  $\frac{1}{4}y'' + y' + y = x^2 - 2x$

A     $y_p = x^2 - 4x + \frac{7}{2}$

B     $y_p = x^2 - 4x - \frac{7}{2}$

C     $y_p = x^2 - 4x + \frac{3}{2}$

D    None of these

88. Find the solution of  $\frac{dr}{d\theta} + r \sec \theta = \cos \theta$ .

A     $(\sec \theta + \tan \theta)r = \cos \theta + c$

B     $(\sec \theta + \tan \theta)r = \theta - \cos \theta + c$

C     $(\sec \theta + \tan \theta)r = \theta + c$

D    None of these

89. The particular integral of  $y'' + y = \sin x$

A  $y_p = \frac{1}{2}x \cos x$

B  $y_p = -\frac{1}{2}x \sin x$

C  $y_p = -\frac{1}{2}x \cos x$

D None of these

90. The solution of  $x^2 y'' + xy' + 4y = 0$  is

A  $y = c_1 x \cos(2 \ln x) + c_2 \sin(2 \ln x)$

B  $y = c_1 \cos(2 \ln x) + c_2 \sin(2 \ln x)$

C  $y = c_1 \cos(\ln x) + c_2 \sin(\ln x)$

D None of these

91. Let  $B = \begin{bmatrix} 1 & 0 \\ 26 & 27 \end{bmatrix}$ . Find a matrix  $A$  such that  $A^3 = B$ .

A  $A = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix}$

B  $A = \begin{bmatrix} -1 & 0 \\ 2 & 3 \end{bmatrix}$

C  $A = \begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$

D None of these

92. Find the eigen values of  $A = \begin{bmatrix} 1 & -4 \\ 3 & -7 \end{bmatrix}$ .

A  $1, -5$

B  $2, -3$

C  $-1, 5$

D None of these

93. Solve  $4x - 2y = 5$ ,  $-6x + 3y = 1$ .

A  $(3, -2)$

B  $(3, -2)$

C  $(1, 2)$

D None of these

94. The derivative of  $f(z) = z^2 \bar{z}$  exists

A at  $z = 1$

B at  $z = -1$

C no where

D at  $z = 0$

95. Evaluate  $\oint_C \frac{e^{2z}}{(z+1)^4} dz$  where  $C$  is the circle  $|z| = 3$ .

A  $\pi i e^{-2}$

B  $\frac{8}{3} \pi i e^{-2}$

C  $2\pi i e^{-2}$

D None of these

96. Choose correct option for the series of  $\tan z$ .

A  $z + \frac{z^3}{3} + \frac{2z^5}{15} + \dots$

B  $\frac{1}{z} + \frac{z^3}{3} + \frac{2z^5}{15} + \dots$

C  $z + \frac{z^3}{6} + \frac{2z^5}{15} + \dots$

D None of these

97. Find the probability that a single toss of a die will result in a number less than 4 if it is given that the toss resulted in an odd number.

A  $\frac{2}{3}$

B  $\frac{1}{3}$

C  $\frac{2}{5}$

D  $\frac{3}{5}$

98. Find the probability that in five tosses of a fair die, a 3 will appear twice.

A  $\frac{25}{3840}$

B  $\frac{125}{3840}$

C  $\frac{625}{3888}$

D  $\frac{325}{3840}$

99. Determine the interval where root lies for the function  $f(x) = x^3 + 3x^2 - 1$ .

A  $(-2, -1)$

B  $(1, 2)$

C  $(2, 3)$

D  $(0, 1)$

100. Choose appropriate formula of Simpson's One - Third rule for  $\int_{x_0}^{x_2} f(x)dx$  where

$$x_0 < \xi < x_2.$$

A  $\frac{h}{3}[f(x_0) + 3f(x_1) + f(x_2)] - \frac{h^5}{90}f^{(4)}(\xi)$

B  $\frac{h}{3}[f(x_0) + 4f(x_1) + f(x_2)] - \frac{h^5}{90}f^{(4)}(\xi)$

C  $\frac{h}{3}[f(x_0) + 2f(x_1) + f(x_2)] - \frac{h^5}{90}f^{(4)}(\xi)$

D  $\frac{h}{3}[f(x_0) + f(x_1) + f(x_2)] - \frac{h^5}{90}f^{(4)}(\xi)$

Seat No. \_\_\_\_\_

SUB: METALLURGY ENGINEERING (MT)

Time: 1 Hour 30 minutes

**Instructions:**

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

- 1 What shape of impression present on sample after Brinell Hardness Test  
A Square B Circle  
C Diamond Pyramid D Hexagon
- 2 In case of Ferritic steels Impact Energy----- with increase in temperature.  
A No change B Decreases  
C Increases D Negative
- 3 In case of creep the deformation of metals is noticeable at temperature above-----  
T<sub>m</sub>=Melting Temperature  
A 0.4T<sub>m</sub> B 0.5T<sub>m</sub>  
C 0.55T<sub>m</sub> D 0.6T<sub>m</sub>
- 4 Wear rate of metals depends on  
A Hardness B Tensile strength  
C Compressive strength D All of above
- 5 A Nicol prism uses a natural polarizing crystal material, like a-----  
A Magnesite crystal B Calcite Crystal  
C Ferrite crystal D Oxide Crystal
- 6 A grain size index of 8 has how many numbers of grains per square inch at 100X magnification.  
A 127 B 128  
C 126 D 122
- 7 Which kind of window is used in X-ray tube for material testing?  
A Cu B Fe  
C C D Be
- 8 Internal stress in the material is determined by  
A X-ray diffraction B Radiography  
C Ultrasonic method D TEM (Transmission electron microscope)
- 9 Simple Hexagonal Lattice has which pair of vector and inter axial angles?  
A  $a=b=c$ ,  $\alpha=\beta=\gamma=90^\circ$  B  $a \neq b \neq c$ ,  $\alpha=\beta=\gamma=90^\circ$   
C  $a=b \neq c$ ,  $\alpha=\beta=90^\circ$  and  $\gamma=120^\circ$  D  $a \neq b \neq c$ ,  $\alpha \neq \beta \neq \gamma=90^\circ$
- 10 Bismuth and Gallium when melts there volume  
A Increases B Equal  
C Decreases D None of above
- 11 The basic functioning of radiography is based on the -----and -----of radiation by materials  
A Transmission and absorption B Absorption and Transmission  
C Both of above D None of above
- 12 2% HNO<sub>3</sub> in alcohol as etchant is used for

- A Copper alloy  
 B Aluminium  
 C Steel and Cast Irons  
 D Nickel alloys
- 13 Shrinkage porosity under radiography is seen as a
- A Circular regular white region  
 B Fibrous irregular dark region with an irregular outline  
 C Dark area with sharp boundaries  
 D White area with an irregular out line
- 14 What is the objective of normalizing ?
- A To refine grain Size  
 B To improve machinability of medium carbon steel  
 C To reduce internal stresses  
 D All above
- 15 To control the warpage and distortion which heat treatment can be useful?
- A Tempering  
 B Spheroidising  
 C Annealing  
 D Austempering
- 16 The size of sample use for Jominy hardenability test is
- A 60mm long 25mm dia  
 B 75 mm long 20 mm dia  
 C 75mm long 25 mm dia  
 D 60mm long 20mm dia
- 17 The twin is always----- dimensional.
- A Three  
 B Two  
 C One  
 D All above
- 18 Plastic deformation is a function of stress, temperature and ----
- A Time  
 B Force  
 C Rate of straining  
 D All above
- 19 Twin lines appear during the ----- operation of some materials.
- A Normalizing  
 B Annealing  
 C Hardening  
 D Carburizing
- 20 High angle grain boundaries means orientation difference between neighboring grains is more than
- A  $25-30^{\circ}$   
 B  $10-15^{\circ}$   
 C  $5-8^{\circ}$   
 D  $30-45^{\circ}$
- 21 BauSchinger effect is seen in----- of metals
- A Cold working  
 B Hot working  
 C Both  
 D None of above
- 22 In case of boiler tubes without lowering the strength generated during cold working which process is required to reduce the internal stresses
- A Recrystallization  
 B Recovery  
 C Normalizing  
 D Hardening
- 23 Recrystallization and melting temperature of Pb is
- A  $0^{\circ}$  and  $337^{\circ}$   
 B  $150^{\circ}$  and  $337^{\circ}$   
 C  $0^{\circ}$  and  $232^{\circ}$   
 D  $150^{\circ}$  and  $232^{\circ}$
- 24 Chemical formula for Ni Ferrite is
- A  $\text{Ni Fe}_2\text{O}_4$   
 B  $\text{Ni Fe}_2\text{O}_3$   
 C  $\text{Ni FeO}$   
 D  $\text{NiO FeO}$
- 25 Surface tension of liquid is measured in
- A dyne /cm  
 B dyne.cm  
 C Erg  
 D  $\text{dyne/cm}^2$
- 26 Jigging is a process of ore concentration based on differences in
- A Conductivity of minerals  
 B Specific gravity of minerals  
 C Hardness of minerals  
 D Surface tension of minerals
- 27 Examples of basic refractories are
- A Quartz  
 B Silica brick

- C Dolomite D Carbon
- 28 Processes to oxidize sulphide minerals known as  
A Heating B Sintering  
C Calcining D Roasting
- 29 Pellet formation involves two stages  
A Nucleation and Growth B Layer by Layer  
C Both D None of above
- 30 Leaching means selective ----- of the metal compound from the ore body by a suitable solvent  
A Oxidation B Chlorination  
C Dissolution D Reduction
- 31 Pressure leaching carried out in a reactor called  
A Autoclave B Agitator  
C Tank D Furnace
- 32 Ion exchange is ----- process than solvent extraction.  
A Faster B Slower  
C Best D Negative
- 33 Chemical formula of Chalcopyrite is  
A CuS B CuFeS<sub>2</sub>  
C Cu<sub>2</sub>S D Cu<sub>5</sub> Fe S<sub>4</sub>
- 34 In a galvanic series in Sea water which can be more anodic  
A Austenitic stainless steels (321, 316) B Austenitic stainless steels(304,316)  
C Ferritic stainless steels (410) D Martensitic stainless steels (430)
- 35 The super saturated solid solution of carbon in Fe that is distorted into a highly strained ----- structure rather than the normal equilibrium BCC structure (  $\alpha$  Ferrite)  
A Body centered tetragonal B Face centered tetragonal  
C Face centered cubic D Hexagonal closed packed
- 36 The void space in crystal structure known as interstices and are referred to as----- and -----  
A Two fold sites and threefold sites B Four fold sites and six fold sites  
C Tetrahedral and octahedral D Both B and C
- 37 ----- is a highly crystalline polymorph of carbon at normal temperature and pressure  
A Fullerene B Diamond  
C Graphite D Ruby
- 38 In all cases, the rate of corrosion increases with increasing-----  
A Temperature B Concentration of corrosive agent  
C Inhibitors D Cold work
- 39 Dezincification is a process of  
A Inter-granular corrosion B Erosion corrosion  
C Selective leaching D Stress corrosion cracking
- 40 Hydrogen embrittlement occurs in certain microstructure of certain metals and alloys, most common being ----- in steels  
A Tempered martensitic B Bainite  
C Ferrite and bainite D Quenched untampered martensitic
- 41 As electropositive elements metals are prone to  
A Oxidation B Reduction

- C Deposition D Hydrogenation
- 42 ----- means measurement of randomness.  
A Entropy B Enthalpy  
C Free energy D Gibbs free energy
- 43 A chemical reaction may generate heat or absorb heat from the surroundings. It is called ----- and ----- reaction.  
A Forward or Backward B Positive or negative  
C Exothermic or endothermic D Oxidation or reduction
- 44 % Oxygen required in Cu for better ductility and electrical conductivity is <  
A < 0.1 B < 0.01  
C > 0.1 D ≤ 0.3
- 45 Henry's law states that the activity of a component is proportional to its-----  
A % concentration B Atomic wt%  
C Mol fraction D None of above
- 46 Hydrometallurgy is very important in the extraction of metals particularly for treating ----- ores.  
A Oxides B Sulphides  
C Complex D A and B
- 47 The positive and negative conductors immersed in the electrolyte during electrolysis are called as -----and ----- respectively  
A Cathode and anode B Anode and cathode  
C +ve cathode and -ve cathode D +Ve Anode and- Ve anode
- 48 An isolated system does not exchange ----- and ----- with its surrounding.  
A Matter and mass B Matter and energy  
C Temperature and Pressure D None of above
- 49 Fugacity indicates the ----- tendency of the component or a substance  
A Ideal B Non-escaping  
C Escaping D Non ideal
- 50 Most of the metallurgical reactions are -----  
A Homogeneous reaction B Hetrogeneous  
C Both D None of above
- 51 When the rate of reaction is constant a reaction is said to be ----- order  
A First B Second  
C Zero D Non order
- 52 Electro winning means-----  
A Extraction of metals B Purification of metals  
C Dissolutions of metals D None of above
- 53  $\text{Fe}_2\text{O}_3 \rightarrow \text{Fe}_3\text{O}_4 \rightarrow \text{Fe}$  Sequence of reduction of iron oxide takes place at----- °C  
A Above 750 B At 750  
C Below 570 D Above 570
- A large mass of material get stuck as a single block in the top portion of the bosh called as  
54 A Scaffolding B Slip  
C Choking D Pillaring
- 55 De-sulphurisation inside blast furnace can be control by -----  
A Having higher basicity B Raising the hearth temperature  
C Increasing the slag volume D All above
- 56 Sponge iron is a term given to the product that is obtained by reduction of iron oxide



- in----- state
- A Liquid B Gaseous  
C solid D All three
- 57 First COREX process installed in 1988 at-----  
A Brazil B South Africa  
C India D Japan
- 58 ----- is the only mechanism by which heat can flow in opaque solids  
A Quantum theory B Conduction  
C convection D Wave theory
- 59 Penetration of carbon to a certain depth in a mild steel specimen during the carburising process is due to  
A Thermal diffusion B Pressure diffusion  
C Molecular diffusion D Radiation
- 60 Slag basicity is the ratio of  
A  $\text{SiO}_2$  to  $\text{CaO}$  B  $\text{CaO}$  to  $\text{SiO}_2$   
C Basic to acid oxides D Both B and C
- 61 Which is the most stable oxide product during refining of Pig iron?  
A  $\text{SiO}_2$  B  $\text{MnO}$   
C  $\text{CaO}$  D  $\text{MgO}$
- 62 The efficiency of steel making processes is assessed by the ----- of steel  
A Yield and quality B Production rate  
C Refractory consumption per ton D All a, b & c
- 63 Which of the following alloying elements when added to plain carbon steel increases its corrosion/oxidation resistance?  
A Chromium B Cobalt  
C Molybdenum D Tungsten
- 64 Which of the following is a demerit of electric arc steel making?  
A Higher temperature can not be attained B Capacity is low compared to other processes  
C It can not remove S and P D All types of steel can not be made by this process
- 65 L D slag contains maximum percentage of-----  
A  $\text{CaO}$  B  $\text{FeO}$   
C  $\text{SiO}_2$  D  $\text{MnO}$
- 66 Grade of pig Iron is decided by its-----content  
A Silicon B Manganese  
C Sulphur D Carbon
- 67 Oxygen is blown in the L.D. convertor through a water cooled lance whose tip is made of  
A Copper B Aluminium  
C Brass D Nickel
- 68 Cores in a centrifugal casting are made of  
A Cast iron B Steel  
C Hard sand D None of above
- 69 ----- patterns are required in shell moulding processes  
A Metal B Wooden  
C Plastic D Sand
- 70 The purpose of inoculation is to----- of the cast metal  
A Decrease the melting B Alter the chemical composition

- temperature
- C Modify the structure and properties
- D Improves the finishing
- 71 Sprue in casting refers to
- A Riser
- B Runner
- C Gate
- D Vertical passage
- 72 Which is the most suitable for welding of heavier sections subjected to severe Load condition?
- A Butt Joint
- B Double V butt joint
- C Open square butt joint
- D Close square butt joint
- 73 TIG is especially useful in welding of
- A Stainless Steel
- B Cast Iron
- C Aluminium
- D Titanium
- 74 Welding of ----- essentially requires preheating
- A Aluminium
- B Cast iron
- C Stainless steel
- D High speed steel
- 75 Supersaturated solid solutions are important for
- A Forming Cementite
- B Precipitation hardening
- C Diffusion
- D Pearlite lamellae spacing
- 76 The following thermocouple may be used for measuring temperature upto 1600 °C
- A Chromel-alumel
- B Copper-constant
- C Iron-Constant
- D Platinum-Platinumrhodium
- 77 There is a change in----- during phase transition
- A Volume
- B Pressure
- C Temperature
- D All a,b,c
- 78 German Silver is an alloy of
- A Silver, Nickel and zinc
- B Silver, Zinc and aluminium
- C Copper, aluminium and silver
- D Copper, Nickel and zinc
- 79 Stainless steel is not corroded by
- A Hydrochloric acid ( 10%)
- B Nitric acid(10%)
- C Sulphuric acid (10%)
- D Saturated brine
- 80 Presence of high phosphorous in cast iron increases its
- A Fluidity
- B Melting point
- C Shrinkage
- D Tensile strength
- 81 The rank of a matrix  $\begin{bmatrix} 3 & 2 & 5 \\ 0 & 4 & 6 \\ 0 & 0 & 7 \end{bmatrix}$  is
- A 3
- B 2
- C 1
- D 0
- 82 A linear system  $x + y + z = 2$ ,  $x + 3y + 3z = 0$ ,  $x + 3y + 5z = 2$  has
- A No Solution
- B Infinite number of solutions
- C Unique solution
- D None of these
- 83 If  $A = \begin{bmatrix} 5 & 2 & 1 \\ 0 & 3 & 6 \\ 0 & 0 & -1 \end{bmatrix}$  then eigen values of  $A^{-1}$  are
- A 5, 3, 2
- B 5, 6, 3
- C 3, 6, 1
- D  $\frac{1}{5}, \frac{1}{3}, \frac{1}{2}$
- 84 If  $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$  then  $A^3 + A^2 - 5A - 5I$  is equal to

- A Identity Matrix B Null Matrix  
C Non-Singular Matrix D None of these
- 85  $\lim_{x \rightarrow 0} \frac{5 \tan x - 3 \sin x}{x^2}$  is equal to  
A 1 B 2  
C 3 D 0
- 86 The value of improper integral  $\int_0^{\infty} e^{-3x} dx$  is  
A 0 B 1  
C  $\frac{1}{3}$  D 3
- 87 If  $U = \tan^{-1} \left( \frac{x^2 + y^2}{xy} \right)$  then  $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y}$  is equal to  
A 2U B 0  
C U D 3U
- 88 If  $\phi = x^2 y^2 z^2$  then  $\text{curl}(\text{grad} \phi)$  is  
A  $\mathbf{0}$  B  $\nabla^2 \phi$   
C  $\nabla^3 \phi$  D  $\nabla \phi$
- 89 The value of  $\oint_C xy dy - y^2 dx$ , where C is square bounded by  $x = 0, x = 2, y = 0$  and  $y = 2$  is  
A 2 B 6  
C 1 D 12
- 90 Solution of  $(x^2 - 2xy)dx - (x^2 - \sin y)dy = 0$  is  
A  $x^2 - (x^2 y + \cos y) = c$  B  $x^2 - x^2 y + \sin y = c$   
C  $x^3 - 3(x^2 y + \cos y) = c$  D  $x^3 - \cos y = c$
- 91 Solution of  $\frac{d^2 y}{dx^2} - 14 \frac{dy}{dx} + 49y = e^{7x}$  is  
A  $C_1 e^{7x} + C_2 e^{-7x} + x^2 e^{7x}$  B  $(C_1 + C_2 x)e^{-7x} + x^2 e^{-7x}$   
C  $(C_1 + C_2 x)e^{-7x} + x^2$  D  $(C_1 + C_2 x)e^{7x} + \frac{x^2}{2} e^{7x}$
- 92 Inverse Laplace transformation of  $\frac{s+5}{s^2+10s+34}$  is  
A  $\frac{1}{3} e^{-5t} \cos 3t$  B  $e^{-5t} \sin 3t$   
C  $e^{-3t} \cos 5t$  D  $e^{-3t} \sin 5t$
- 93 Which one is Analytic function  
A  $\sin Z$  B  $\bar{Z}$   
C  $|Z|$  D  $Z\bar{Z}$
- 94 Value of  $\int_C \frac{3Z^2}{Z-1} dZ$ , (where C is  $|Z-1| < 2$ ) is  
A  $\pi i$  B  $2\pi i$   
C  $6\pi i$  D 0
- 95 Residue of  $f(Z) = \frac{1}{Z^2(Z-1)}$  at simple pole is  
A 4 B 1  
C 2 D 3
- 96 Newton-Raphson iteration formula for  $x^2 + x + 1 = 0$  is  
A  $x_{n+1} = \frac{2x_n^2 + 1}{2x_n}$  B  $x_{n+1} = \frac{2x_n^2 - 1}{2x_n}$

- C  $x_{n+1} = \frac{x_n^2 - 1}{2x_n + 1}$  D  $x_{n+1} = \frac{3x_n^2 + 2}{2x_n + 1}$
- 97 Value of integral  $\int_0^1 \frac{1}{1+x} dx$  using Simpson's 1/3 rule with step size  $h = 0.25$  is
- A 0.6932 B 0.96733  
C 0.68333 D 0.96332
- 98 If  $\frac{dy}{dx} = 3x + y$ ,  $y(1) = 1.3$ ,  $h = 0.1$ , by Runge-Kutta second order method to what is an approximate value of  $y(1.1)$
- A 1.5677 B 1.7665  
C 1.6555 D 1.4566
- 99 Three coins are tossed together and let random variable  $X$  be the number of heads in each outcome then Mean is
- A 2 B  $\frac{1}{2}$   
C  $\frac{5}{2}$  D  $\frac{3}{2}$
- 100 In binomial distribution formula of calculating standard deviation is
- A  $\sqrt{p}$  B  $\sqrt{pq}$   
C  $\sqrt{npq}$  D  $\sqrt{np}$



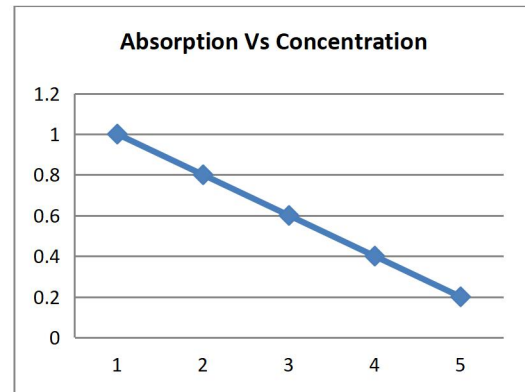
8. As per IS 10500- Indian drinking water quality standards, \_\_\_\_\_ is the desired limit for Iron in drinking water.

- |       |        |
|-------|--------|
| A 0.3 | B 0.03 |
| C 0.5 | D 0.05 |

9. Acidity in water is caused due to \_\_\_\_\_.

- |                        |                 |
|------------------------|-----------------|
| A Free CO <sub>2</sub> | B Mineral acids |
| C Aluminum Sulfate     | D All of these  |

10. Following standard curve depicts the colorimetric plot for \_\_\_\_\_.



- |                      |                      |
|----------------------|----------------------|
| A Iron               | B Fluoride           |
| C PO <sub>4</sub> -P | D NH <sub>3</sub> -N |

11. \_\_\_\_\_ kg/day of lime is required to add on treatment facility of 10 MLD of water with 500 mg/lit of Total hardness as CaCO<sub>3</sub> and 200 mg/lit of Non carbonate hardness as CaCO<sub>3</sub>.

- |        |        |
|--------|--------|
| A 3770 | B 2220 |
| C 1480 | D 2120 |

12. \_\_\_\_\_ kg/day of Chlorine will be required to treat 10 MLD of water with required chlorine dose of 2 mg/lit.

- |       |       |
|-------|-------|
| A 0.2 | B 2.0 |
| C 20  | D 200 |

13. Nalgonda Method is widely adopted to remove \_\_\_\_\_ in water treatment.

- |            |            |
|------------|------------|
| A Nickel   | B Iron     |
| C Chromium | D Fluoride |

14. \_\_\_\_\_ is not a type of depth filtration.

- |                                 |                    |
|---------------------------------|--------------------|
| A Membrane filtration           | B Sand filtration  |
| C Diatomaceous earth filtration | D Cloth filtration |

15. In membrane filtration processes, Micro filtration is more suitable and efficient for the removal of particle size range \_\_\_\_\_.

- |   |   |
|---|---|
| A 1 X 10 <sup>-4</sup> to 1 X 10 <sup>-5</sup> μm | B 0.05 to 0.005 μm                                |
| C 1.0 to 0.1 μm                                   | D 5 X 10 <sup>-3</sup> to 5 X 10 <sup>-4</sup> μm |

- Page 3 of 10

25. The highest point of the interior of a sewer pipe at any cross section is known as \_\_\_\_\_.  
 A Soffit B Invert  
 C Drop point D Leader

26. In conventional sewage treatment plant, effluent coming out of \_\_\_\_\_ has minimum of suspended solids.  
 A Grit removal tank B Primary settling tank  
 C Secondary settling tank D Aeration tank

27. In conventional sewage treatment plant, Surface Loading Rate of secondary settling tank is generally preferred in the range of \_\_\_\_\_  $\text{m}^3/\text{d}/\text{m}^2$   
 A 10-30 B 60-120  
 C 200-400 D 1000-1500

28. BOD/COD ratio in the range of 0.5-0.7 indicates \_\_\_\_\_.  
 A Better suitability of chemical treatment processes B Better suitability of biological treatment processes  
 C Toxicity into the wastewater D All of the A,B & C are correct

29. \_\_\_\_\_ type of pollutants are generally not being targeted to be removed from conventional sewage treatment in Indian conditions.  
 A Dissolve inorganic B Suspended organic  
 C Dissolve organic D Oily & greasy

30. In conventional activated sludge process, aeration tank contains MLSS in the range of \_\_\_\_\_  $\text{mg}/\text{lit}$ .  
 A 20-30 B 200-300  
 C 2000-3000 D > 3000

31. Following may not be the modification process in conventional activated sludge process.  
 A Step aeration B Tapered aeration  
 C Circular aeration D Pure oxygenation

32. Sludge retention time in most anaerobic standard rate digesters of sewage treatment is kept in \_\_\_\_\_ range values.  
 A 2-4 months B 2-4 days  
 C 20-40 days D 2-4 hours

33. In aerobic treatment process, Nitrosomonas convert \_\_\_\_\_.  
 A  $\text{NH}_3$  to  $\text{NO}_2^-$  B  $\text{NO}_2^-$  to  $\text{HNO}_3$   
 C  $\text{NO}_2^-$  to  $\text{NO}_3^-$  D  $\text{NH}_3$  to  $\text{N}_2\text{O}$

34. Trickling filters used in sewage treatment are typical example of \_\_\_\_\_.  
 A Suspended growth system B Attached growth system  
 C Combined growth system D None of these



35. As per National Ambient Air Quality Standards in India, \_\_\_\_\_ is the maximum permissible concentration of Nitrogen Dioxide for 24 hours average in urban air.
- A 40  $\mu\text{g}/\text{M}^3$  B 60  $\mu\text{g}/\text{M}^3$   
C 80  $\mu\text{g}/\text{M}^3$  D 100  $\mu\text{g}/\text{M}^3$
36. \_\_\_\_\_ is the secondary air pollutant may be found in urban air of dense traffic zones.
- A  $\text{SO}_2$  B  $\text{O}_3$   
C  $\text{NO}_2$  D All of above
37. A \_\_\_\_\_ plume pattern occurs under essentially neutral stability, when environmental lapse rate is equal to the adiabatic lapse rate.
- A Coning B Looping  
C Fanning D Fumigation
38. (i)Mist (ii) Fog (iii) Smoke (iv) Fume  
\_\_\_\_\_ of the above is/are type/s of aerosol.
- A All of these B None of these  
C (i),(iii) & (iv) D (ii),(iii) & (iv)
39. \_\_\_\_\_ is the air pollutant gas directly associated in destructing the cardio vascular system of human.
- A CO B  $\text{CO}_2$   
C  $\text{SO}_2$  D  $\text{NO}_2$
40. \_\_\_\_\_ gas is contributing least in green house effect enhancement on earth surface.
- A  $\text{CO}_2$  B  $\text{SO}_2$   
C  $\text{NO}_2$  D CFC
41. \_\_\_\_\_ is the concentration of  $\text{SO}_2$  in ppm, if sampled air containing 80  $\mu\text{g}/\text{M}^3$  of  $\text{SO}_2$  at 25° c temperature and 1 atm pressure.
- A 0.003 B 0.03  
C 0.3 D 3.0
42. Centrifugal separators are most commonly found efficient & preferable to remove particles of size range \_\_\_\_\_.
- A 0.1-1.0  $\mu\text{m}$  B 10-25  $\mu\text{m}$   
C 1.0-10  $\mu\text{m}$  D 25-100  $\mu\text{m}$
43. In standard cyclone configuration, ratio of height of cylindrical portion and conical portion is kept as \_\_\_\_\_.
- A 0.5 B 1.0

44. The bag filters are of generally \_\_\_\_\_ type/s.
- C 1.5 D 2.0
- A Shaker type B Reverse-air type
- C Pulse jet type D All of above
45. Wet venturi scrubbers are quite effectively used in removing \_\_\_\_\_ pollutants from the gaseous phase.
- A Gaseous pollutants B Particulate pollutants
- C Both together D None of (A) & (B)
46. The range of normal human hearing is \_\_\_\_\_.
- A 0.2-2.0 Hz B 2.0-20 Hz
- C 20-20000 Hz D >20000 Hz
47. According to the Noise Pollution (R &C) Rules, India, the day and night time noise level limits in ambient air for residential area expressed in dBA Leq. are \_\_\_\_\_.
- A 55 & 45 B 50 & 40
- C 65 & 55 D 75 & 70
48. Levels of safe noise depend on \_\_\_\_\_.
- A Frequency B Levels of noise and exposure
- C Pitch D Area
49. The range over which the sound levels are fluctuating in an interval of time is called \_\_\_\_\_.
- A Sound Pressure B Sound Power
- C Noise Climate D Aplitude
50. As per Occupational Safety and Health Administration (OSHA) regulations, no exposure in excess of \_\_\_\_\_ sound pressure level is permitted.
- A 90 dBA B 105 dBA
- C 115 dBA D 130 dBA
51. Following is not the part of EIA
- A Screening B Safety assessment
- C Scoping D Base line survey
52. First step towards preservation of ozone layer was taken at \_\_\_\_\_.
- A Montreal Protocol B Basel Convention
- C Kyoto Protocol D Rio Declaration
53. A project may not be permitted if EIA reveals impacts that are \_\_\_\_\_.
- A naturally reversible B Short term
- C naturally irreversible D None of the above
54. Water (Prevention and Control of Pollution) Act 1974 was enacted \_\_\_\_\_.
- A For maintaining and restoring B To have wholesome environment
- wholesomeness of water bodies
- C To prevent pollution of D All of the above
- environment
55. The Wildlife Protection Act was enacted in \_\_\_\_\_.
- A 1976 B 1971
- C 1975 D 1972
56. \_\_\_\_\_ enacted under the Environment Protection Act, 1986.

- A Municipal Solid Waste (M& H) Rules      B Hazardous Waste (M & H) Rules
- C Bio Medical Waste (M & H) Rules      D All of these
57. Water Cess Act implemented in India in the year \_\_\_\_\_.  
 A 1977      B 1974  
 C 1971      D 1981
58. Pollution control & regulatory activities in to the Union territory of India is governed by \_\_\_\_\_.  
 A Nearby State Pollution Control Board      B MoEF & CC  
 C Pollution Control Committee      D Central Pollution Control Board
59. As per Bio-medical waste rule, bio medical waste can be mixed with \_\_\_\_\_.  
 A Compostable garden waste      B Inorganic Municipal Solid Waste  
 C Organic Municipal Solid Waste      D None of these
60. Rules notified by MOEF in year 2016  
 A Plastic waste management rules      B Environment Protection Act  
 C Bio Medical Waste (M&H) Rule      D All of these
61. Bio medical waste is classified into \_\_\_\_\_ categories, as per World Health Organization (WHO).  
 A 02      B 03  
 C 04      D 05
62. The Environmental Audit scheme was mainly framed on the principle/s of  
 (i.) Polluters' pay  
 (ii.) Continual improvement  
 (iii.) Meeting regulatory standards & generation of database  
 A (i.) & (ii.)      B (i.) (ii.) & (iii.)  
 C (ii.) & (iii.)      D (i.) & (iii.)
63. Integrated Solid Waste Management system offers \_\_\_\_\_ benefits.  
 (i) Better resource use efficiency  
 (ii) Savings in management cost  
 (iii) Better business opportunity & economic growth  
 (iv) Turning vicious circle into virtuous circle  
 A (i) (ii) & (iii)      B (i) (ii) & (iv)  
 C (ii) (iii) & (iv)      D All of these
64. An average Indian urban citizen (Class-II cities) produces solid waste in the range of \_\_\_\_\_.  
 A 50-100 gms      B 500-1000 gms  
 C 1500-3000 gms      D 3000-5000 gms
65. High calorific value waste indicates amenability for \_\_\_\_\_.  
 A Composting      B Landfilling  
 C Incineration      D Pyrolysis
66. \_\_\_\_\_ is typically not a part of landfill construction or operations.

- A Liners B Aerators  
 C Air vents D Leachate well
67. \_\_\_\_\_ is the aerobic composting technique in traditional way.  
 A Amravati method B Bangalore method  
 C Indore method D None of these
68. The most serious environmental effect posed by hazardous wastes is \_\_\_\_\_.  
 A Air pollution B Increased use of land for landfills  
 C Contamination of ground water D None of these
69. Heavy metals like Arsenic, Cadmium and Cyanide effect \_\_\_\_\_.  
 A Immune system B Skin  
 C Respiratory system D Nervous system
70. Spent caustic is from metal finishing is an example of \_\_\_\_\_ waste category.  
 A Organic aqueous B Inorganic aqueous  
 C Organic liquid D Organic sludge
71. Toxicity of hazardous waste is generally characterized by \_\_\_\_\_.  
 A Instability B Volume  
 C Temperature D Dose
72. Bio diversity is of importance as it offers \_\_\_\_\_.  
 A Stability of ecosystem B Stability of atmosphere  
 C Stability of species D Stability of research
73. \_\_\_\_\_ of the followings is not an in-situ conservation method.  
 A Zoos B National parks  
 C Sanctuaries D Bio sphere reserves
74. Metals are produced as waste in industries like \_\_\_\_\_.  
 A Skiing B Mining  
 C Electroplating D Digging
75. \_\_\_\_\_ is the program run by United Nations related to sustainable environment.  
 A Agenda 21 B GHC indicator  
 C IPCC D UNEP
76. For Gold LEED certification, \_\_\_\_\_ points are required.  
 A 40-49 B 60-79  
 C 50-59 D 80-100
77. In waste to energy processes, carbon can be stored from organic matter in the form of \_\_\_\_\_.  
 A Biomass B Bio fuel  
 C Bio energy D Bio carbon
78. In aquatic eco systems, carbon is stored in \_\_\_\_\_.  
 A Marine animals B Marine plants  
 C Sediments and rocks D Sea water
79. Hot Spot Areas in ecology have \_\_\_\_\_.  
 A High density of hot springs B Low density of bio diversity  
 C Low density of endangered species D High density of bio diversity
80. The 'Miracle material' that can convert CO<sub>2</sub> into liquid fuel is \_\_\_\_\_.  
 A Propene B Potassium  
 C Copper D Graphene

- 81 The rank of a matrix  $\begin{bmatrix} 7 & 0 & 0 \\ 5 & 3 & 0 \\ 1 & 2 & 8 \end{bmatrix}$  is
- A 0 B 1  
C 3 D 2
- 82 A linear system  $x + y + z = 2$ ,  $2x + 3y + z = 5$ ,  $2x + 2y + 2z = 4$  has
- A Infinite number of solutions B No Solution  
C Unique solution D None of these
- 83 If  $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$  then eigen values of  $A^{-1}$  are
- A 4, 1, 2 B  $\frac{1}{2}, 1, \frac{1}{4}$   
C 3, 2, 4 D 4, 3, 1
- 84 If  $A = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$  then  $A^3 - 4A^2 + 5A - 2I$  is equal to
- A Null Matrix B Identity Matrix  
C Non-Singular Matrix D None of these
- 85  $\lim_{x \rightarrow 0} \frac{5 \tan x + 3 \sin x}{x^2}$  is equal to
- A 1 B 2  
C 3 D 0
- 86 The value of improper integral  $\int_0^\infty e^{-7x} dx$  is
- A 0 B 1  
C  $\frac{1}{7}$  D 7
- 87 If  $U = \tan^{-1} \left( \frac{x^2 + y^2}{x^2 - y^2} \right)$  then  $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y}$  is equal to
- A 0 B U  
C 2U D 3U
- 88 If  $\phi = xyz$  then  $\text{curl}(\text{grad} \phi)$  is
- A  $\nabla \phi$  B  $\mathbf{0}$   
C  $\nabla^3 \phi$  D  $\nabla^2 \phi$
- 89 The value of  $\oint_C xy^2 dy - y^3 dx$ , where C is square bounded by  $x = 0$ ,  $x = 1$ ,  $y = 0$  and  $y = 1$  is
- A 4 B 3  
C  $\frac{3}{4}$  D  $\frac{4}{3}$
- 90 Solution of  $(x - y \cos x)dx - (\sin x)dy = 0$  is
- A  $x^2 - 2y \sin x = c$  B  $x - 2y^2 \sin x = c$   
C  $x^2 - 2y^2 \sin x = c$  D  $x - 2y \sin x = c$
- 91 Solution of  $\frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} + 9y = e^{-3x}$  is
- A  $C_1 e^{3x} + C_2 e^{-3x} + x^2 e^{3x}$  B  $(C_1 + C_2 x) e^{-3x} + \frac{x^2}{2} e^{-3x}$

- C  $(C_1 + C_2 x)e^{-3x} + x^2$  D  $(C_1 + C_2 x)e^{3x} + \frac{x}{2}e^{3x}$
- 92 Inverse Laplace transformation of  $\frac{5}{(s^2+9)(s^2+4)}$  is
- A  $\sin 2t - \sin 3t$  B  $t(\sin 2t + \sin 3t)$   
 C  $\frac{1}{6}(3 \sin 2t - 2 \sin 3t)$  D  $e^{2t} + \sin 3t$
- 93 Which one is Analytic function
- A  $\bar{Z}$  B  $Z^3$   
 C  $|Z|$  D  $Z\bar{Z}$
- 94 Value of  $\int_C \frac{z}{z-3} dz$ , (where  $C$  is  $|Z - 3| < 1$ ) is
- A  $4\pi i$  B  $2\pi i$   
 C  $3\pi i$  D  $6\pi i$
- 95 Residue of  $f(Z) = \frac{Z+4}{Z^2(Z-3)}$  at simple pole is
- A  $\frac{7}{9}$  B  $7$   
 C  $1$  D  $9$
- 96 Newton-Raphson iteration formula for  $x^2 - x - 1 = 0$  is
- A  $x_{n+1} = \frac{x_n^2 + 1}{2x_n - 1}$  B  $x_{n+1} = \frac{x_n^2 - 1}{2x_n - 1}$   
 C  $x_{n+1} = \frac{x_n^2 + 1}{2x_n + 1}$  D  $x_{n+1} = \frac{x_n^2 + 2}{2x_n + 1}$
- 97 Value of integral  $\int_0^3 \frac{1}{1+x} dx$  using Simpson's 3/8 rule with step size  $h = 0.5$  is
- A  $1.3455$  B  $1.3888$   
 C  $1.5345$  D  $1.1555$
- 98 If  $\frac{dy}{dx} = -y$ ,  $y(0) = 1$ ,  $h = 0.1$ , by Rungee-Kutta third order method to what is an approximate value of  $y(0.1)$
- A  $0.9532$  B  $0.7957$   
 C  $0.9048$  D  $0.9519$
- 99 Mean of binomial probability distribution is 857.6 and probability is 64% then number of values of binomial distribution is
- A  $1040$  B  $1340$   
 C  $1140$  D  $1240$
- 100 Number of product manufacture in a factory in a day are 3500 and probability that some pieces are defective is 0.55 then mean is
- A  $1925$  B  $1875$   
 C  $2025$  D  $6370$

Seat No. \_\_\_\_\_

**SUB: BIOMEDICAL ENGINEERING (BM)**

**Time:1 Hour 30 minutes**

**Instructions:**

- 1. Ensure that all pages are printed.**
- 2. Use Black ball pen only**
- 3. Change in option is not allowed**
- 4. There is no negative marking**
- 5. Use of non -programmable scientific calculator is allowed**

1. Muscle fatigue is what?  
A When a muscle has too much sugar and can't function correctly  
B When a muscle becomes spasmic  
C When a muscle contracts too often without enough oxygen  
D A muscle disease
2. During contraction actin and myosin filaments;  
A Become larger  
B Become smaller  
C Slide over each other  
D Slide between each other
3. Fibrositis is;  
A Injury to a ligament  
B Inflammation of a tendon  
C Inflammation of a muscle  
D Lack of muscle tone
4. Filtered blood is re-absorbed here;  
A Distal convoluted tubules  
B Loop of Henle  
C Hilum  
D Bowmans Capsule
5. The pelvis is what kind of joint?  
A Pivot  
B Hinged  
C Fixed  
D Gliding
6. Bones provide storage for;  
A Vitamin D  
B Calcium and phosphorus  
C Thrombocytes  
D Melatonin
7. The dermis has the ability to absorb;  
A Mineral oils  
B Chemical substances  
C Water  
D Aqueous creams
8. In which system won't you find lymph?  
A Central nervous system  
B Reproductive system  
C Urinary system  
D Muscular system
9. Where does tissue respiration take place?  
A Mitochondria  
B Monocytes  
C Haemoglobin  
D Erythrocytes
10. Which of the following does not act as a neurotransmitter?  
A Acetylcholine  
B Epinephrine  
C Norepinephrine  
D Cortisone
11. Flexion at elbow is brought about by  
A Biceps  
B Triceps  
C Both (A) and (B)  
D None of the above.
12. The bone cells which are involved in building of bone are  
A Osteoblasts  
B Osteoclasts  
C Osteocytes  
D None of the above
13. 'Lordosis' is also called  
A Round back  
B Hollow back

- C Lateral back  
D Back curve

14. During abduction the arm moves  
A Towards the body  
B Away from the body  
C In front of the chest  
D None of the above

15. The cartilage which serves to cushion the impact of large forces on bone ends is called  
A Fibrous cartilage  
B Hyaline cartilage  
C Notch  
D fossa

16. Which plane of motion lies vertically and divides the body into left and right halves?  
A The sagittal plane  
B The frontal plane  
C The transverse plane  
D Anatomical neutral position

17. Largest bone in the human body is;  
A hummers  
B Femur  
C Tibia  
D fibula

18. Shortest bone in the human  
A phalange  
B metatarsal  
C in nominate bone  
D tarsal

19. Which of the following is responsible for limiting the range of movements of joint?  
A Tendons  
B Ligaments  
C Both (A) and (B)  
D Muscle fibers

20. Which is not a correct statement regarding stance phase  
A Is usually about 60% of the cycle  
B Begins at toe off  
C Begins at heel strike  
D Ends at heel strike

21. For a base current of  $10\text{ }\mu\text{A}$ , what is the value of collector current in common emitter if  $\beta_{dc} = 100$ .  
A  $10\text{ }\mu\text{A}$   
B  $100\text{ }\mu\text{A}$   
C  $10\text{ mA}$   
D  $1\text{ mA}$

22. In a CB amplifier the maximum efficiency could be;  
A 25%  
B 50%  
C 85%  
D 99%

23. Generally, the gain of a transistor amplifier falls at high frequencies due to .....  
A Skin effect  
B Internal capacitance of the device  
C Coupling capacitor at the output  
D Coupling capacitor at the input

24. The binary number 10101 is equivalent to decimal number ;  
A 19  
B 12  
C 21  
D 27

25. The universal gate is;  
A OR gate  
B NAND gate  
C AND gate  
D None of the above

26. A 12 bit ADC is used to convert analog voltage of 0 to 10 V into digital. The resolution is;  
A 24.4 mV  
B 1.2 V  
C 2.44 mV  
D none of these

27. The output of a half adder is;  
A Carry  
B Sum  
C Sum and Carry  
D none of these

28. The first bioinformatics database was created by;  
A Richard Durbin  
B Dayhoff  
C Michael J. Dunn  
D Pearson

29. Analysing or comparing entire genome of species  
A Bioinformatics  
B Genomics  
C Proteomics  
D Pharmacogenomics



30. This will reject any common mode signal that appears simultaneously at both amplifier input terminal.  
 A ac coupled amplifiers B dc amplifiers  
 C carrier amplifiers D differential amplifiers
31. What is the total number of quantization errors in the computation of single point DFT of a sequence of length  $N$ ?  
 A  $2N$  B  $4N$   
 C  $8N$  D  $12N$
32. How many number of bits are required to compute the DFT of a 1024 point sequence with a SNR of 30db?  
 A 15 B 10  
 C 5 D 20
33. If  $x(n)$  is a discrete-time signal, then the value of  $x(n)$  at non integer value of 'n' is:  
 A Zero B Positive  
 C Negative D Not defined
34. The odd part of a signal  $x(t)$  is:  
 A  $x(t)+x(-t)$  B  $x(t)-x(-t)$   
 C  $(1/2)*(x(t)+x(-t))$  D  $(1/2)*(x(t)-x(-t))$
35. The function given by the equation  $x(n)=1$ , for  $n=0$ ;  $=0$ , for  $n \neq 0$  is a:  
 A Triangular function B Ramp function  
 C Impulse function D Step function
36. The Nyquist theorem for sampling;  
 1) Relates the conditions in time domain and frequency domain  
 2) Helps in quantization  
 3) Limits the bandwidth requirement  
 4) Gives the spectrum of the signal  
 A 1, 2 and 3 are correct B 1 and 3 are correct  
 C 1 and 2 are correct D All the four are correct
37. DTFT is the representation of;  
 A Periodic Discrete time signals B Aperiodic Discrete time signals  
 C Aperiodic continuous signals D Periodic continuous signals
38. The ROC of a system is the;  
 A range of  $z$  for which the  $z$  transform converges B range of frequency for which the  $z$  transform exists  
 C range of frequency for which the signal gets transmitted D range in which the signal is free of noise
39. The region of convergence of  $x/(1+2x+x^2)$  is;  
 A Negative B Positive  
 C 1 D 0
40. Decimation is a process in which the sampling rate is;  
 A Enhanced B Reduced  
 C Stable D Unpredictable
41. Attenuation coefficient of bone is  $600 \text{ m}^{-1}$  for x-rays of energy 20 keV and intensity of beam of x-rays is  $20 \text{ Wm}^{-2}$ , then intensity of beam after passing through a bone of 4mm is;  
 A  $1.8 \text{ Wm}^{-2}$  B  $2.6 \text{ Wm}^{-2}$   
 C  $2.0 \text{ Wm}^{-2}$  D  $3.0 \text{ Wm}^{-2}$
42. Bones look white in x-ray photograph because;  
 A they are bad absorbers of x-rays B they reflect x-rays  
 C they are good absorbers of x-rays D they are bad absorbers of ultraviolet rays
43. In best piezo-electric substances, maximum value of strain is about

- |     |   |  |
|-----|---|--|
|     | A 0.050 %   | B 0.030 %  |
|     | C 0.040 %   | D 0.010 %  |
| 44. | With gel between skin and transducer percentage of reflected intensity of ultrasonic is |  |
|     | A 0.03%   | B 0.06%  |
|     | C 0.05%   | D 0.08%  |
| 45. | Soft x-rays have  |  |
|     | A high energies   | B low energies                                     |
|     | C lowest frequency  | D longest wavelength                               |
| 46. | Interosseous skeletal tumor is best diagnosed by  |  |
|     | A Plain X-ray   | B NMR  |
|     | C CT scan   | D Ultrasound                                       |
| 47. | Isotope used in myocardial perfusion scan is  |  |
|     | A Technetium  | B Thallium   |
|     | C Stannous Pyrophosphate  | D Gallium  |
| 48. | Pixels are digital numbers that are composed of;  |  |
|     | A Colour  | B Intensity levels                                 |
|     | C Dots  | D Bits   |
| 49. | For line detection we use mask that is  |  |
|     | A Laplacian   | B Gaussian   |
|     | C ideal   | D Butterworth                                      |
| 50. | Reflection of rectangular SE is always  |  |
|     | A translated  | B asymmetric                                       |
|     | C symmetric   | D square   |
| 51. | Which of the following are examples of biomaterials?                                    |  |
|     | I. Titanium   |  |
|     | II. Ceramics  |  |
|     | III. Bovine bone  |  |
|     | A I, II, and III  | B III only   |
|     | C I and II Only   | D None   |
| 52. | In 8085 microprocessor, how many interrupts are maskable                                |  |
|     | A 2   | B 3  |
|     | C 4   | D 5  |
| 53. | Which stack is used in 8085 microprocessor  |  |
|     | A FIFO  | B FILO   |
|     | C LIFO  | D LILO   |
| 54. | Which one of the following address techniques is not used in 8085 microprocessor        |  |
|     | A Register  | B Immediate  |
|     | C Register indirect   | D Relative   |
| 55. | In how many different modes a universal shift register operates?                        |  |
|     | A 2   | B 3  |
|     | C 4   | D 5  |
| 56. | SCON in serial port is used for which operation?  |  |
|     | A Transferring data   | B Receiving data                                   |
|     | C Controlling   | D Controlling and transferring                     |
| 57. | Auxiliary carry is set during which condition?  |  |
|     | A When carry is generated from D3 to D4   | B When carry is generated from D7                  |
|     | C When carry is generated from both D3 to D4 and D7                                     | D When carry is generated at either D3 to D4 or D7 |
| 58. | Which pin provides a reset option in 8051?  |  |

- A 1  
 C 8
- B 9  
 D 11
59. External Access is used to permit;
- A Peripherals  
 C ALE
- B Power supply  
 D Memory interfacing
60. Timer 0 is a \_\_\_\_\_ bit register.
- A 32-bit  
 C 16-bit
- B 8-bit  
 D 10-bit
61. \_\_\_\_\_ is the superimposed wave of neuron potentials operating in a non-synchronrized manner in a physical sense.
- A VCG  
 C PCG
- B ECG  
 D EEG
62. What are generally designed to have a very high value of input impedance to take care of high electrode impedance?
- A Montages  
 C Preamplifiers
- B Electrodes  
 D Filters
63. EEG machines have notch filter sharply tuned at \_\_\_\_\_ Hz as to eliminate mains frequency interference.
- A 10  
 C 30
- B 50  
 D 70
64. Which type of transducer requires energy to be put into it in order to translate changes due to the measurand?
- A active transducers  
 C powered transducers
- B passive transducers  
 D local transducers
65. The ability of the sensor to see small differences in reading is called;
- A resolution  
 C offset
- B drift  
 D linearity
66. Active transducers work on the principle of;
- A energy alteration  
 C mass conversion
- B volume conversion  
 D energy conversion
67. The frequency range of ECG IS;
- A 0.05-150 HZ  
 C 500-1500 Hz
- B 5-500 kHz  
 D 0.5-150 MHz
68. Which of the following amplifier circulatory is employed to reduce the hum noise generated by the power supply in the ECG circuit?
- A band pass filters  
 C notch filters
- B high pass filters  
 D low pass filters
69. Liquid part of blood IS;
- A Platelets  
 C White Blood Cells
- B Red Blood Cells  
 D Plasma
70. How much quantity of oxygen bound with haemoglobin in the normal arterial blood?
- A 20.3ml %  
 C 21.5ml %
- B 19.4ml %  
 D 20.1ml %
71. Which of the following is an example of Hinge joint?
- A Hip joint  
 C Ankle Joint
- B Elbow Joint  
 D All the above
72. Carpal joint is the example of
- A Pivot joint  
 C Hinge joint
- B Condylloid joint  
 D Ball and socket joint

73. A golf ball is hit at an angle of elevation of  $37^\circ$  and an initial velocity of  $45\text{ms}^{-1}$ . If all fluid forces are ignored and  $g$  is taken to  $9.8\text{ms}^{-2}$  then what would the time to maximum height be?
- A  $4.78\text{s}$  B  $4.59\text{s}$   
C  $5.82\text{s}$  D  $4.48\text{s}$
74. Which of the following is a protein sequence database;
- A DDBJ B EMBL  
C GenBank D PIR
75. Functional residual capacity of person can be measured by;
- A Spirometer B Laryngoscope  
C Colorimeter D Body plethysmograph
76. The Kidney regulates the \_\_\_\_\_ of the blood plasma
- A Concentration B Colour  
C Viscosity D Composition
77. \_\_\_\_\_ is added to a polymer to make it flexible.
- A Elasticiser B Plasticiser  
C Catastrophes D None of these
78. \_\_\_\_\_ rubber is used for cosmetic implants.
- A Silicon B Butyl  
C Both A & B D None of these
79. In human body, Blood is;
- A Newtonian fluid B Non Newtonian fluid  
C Both A & B D None of these
80. The body fluid that lubricates the joint cavities and bursae,
- A Saliva B CSF  
C Synovial D Plasma
81. A reduced row echelon form invertible matrix is
- A an upper triangular matrix B a lower triangular matrix  
C identity matrix C none of the other options
82. Suppose that  $1$  is an eigenvalue and  $\bar{X}$  is an eigenvector of a square matrix  $A$ , then which of the following statements is incorrect:
- A  $1$  is an eigenvalue of  $A^2$  B  $\bar{X}$  is an eigenvector of  $A^2$   
C  $1$  is an eigenvalue of  $A^T$  D  $\bar{X}$  is an eigenvector of  $A^T$
83. The function  $f(x) = \sin x$  is increasing in
- A  $[0, \pi]$  B  $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$   
C  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$  D  $[\pi, 2\pi]$
84. The maximum value of  $f(x) = \frac{1}{4}(x^4 - 2x^2)$  in  $[-1, 2]$
- A  $2$  B  $-1$   
C  $0$  D  $1$

85. For the forward difference operator  $\Delta$ ,  $\Delta y_2$  is
- A  $y_2 - y_1$  B  $y_3 - y_2$   
 C  $\frac{1}{2}(y_3 - 2y_2 + y_1)$  D  $y_{5/2} - y_{3/2}$
86.  $u = xe^{y/x}$  is
- A homogeneous function with degree 0 B homogeneous function with degree 1  
 C homogeneous function with degree 2 D not homogeneous
87.  $\frac{\partial}{\partial x}(x^y + y^x) =$  \_\_\_\_\_
- A  $x^y \ln x + \frac{x}{y}y^x$  B  $\frac{y}{x}x^y + y^x \ln y$   
 C  $yx^{y-1} + xy^{x-1}$  D  $x^y \ln x + y^x \ln y$
88. For  $f(x,y) = 5$ ,  $\frac{dy}{dx} =$  \_\_\_\_\_
- A  $\frac{f_x}{f_y}$  B  $-\frac{f_x}{f_y}$   
 C  $-\frac{f_y}{f_x}$  D  $\frac{f_y}{f_x}$
89. The order of the differential equation  $(y')^2 = 4y^3$  is
- A 2 B 1  
 C 3 D 4
90.  $\text{grad}(xyz)$  at  $\hat{i} - \hat{j} + \hat{k}$  has the value
- A  $-\hat{i} + \hat{j} - \hat{k}$  B  $\hat{i} - \hat{j} + \hat{k}$   
 C  $-\hat{i} - \hat{j} + \hat{k}$  D  $\hat{i} + \hat{j} - \hat{k}$
91. For a complex variable  $z$ ,  $|z| = 1$  represents
- A two points  $(\pm 1, 0)$  B four points  $(\pm 1, 0), (0, \pm 1)$   
 C Circle C Straight line
92. If  $I = \oint \frac{2z}{(z+2)(z+3)} dz$  over the circle, centered at  $z = 0$  and radius 1, then
- A  $I = 2\pi i$  B  $I = -8\pi i$   
 C  $I = 12\pi i$  D  $I = 0$
93. If  $p$  is the probability of turning an integer on a dice rolled once, then
- A  $p = 0$  B  $0 < p < 1$   
 C  $p = 1$  D  $p > 1$
94.  $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx =$  \_\_\_\_\_
- A  $\frac{\pi^2}{8}$  B  $\frac{\pi^2}{32}$   
 C  $\frac{\pi^2}{24}$  D  $\frac{\pi^2}{16}$
95. Which form of numbers from given below is an indeterminate form?
- A  $\infty^\infty$  B  $\infty + \infty$   
 C  $0^\infty$  D  $\infty^\infty$
96. If  $L\{f(t)\} = \bar{f}(s)$  then  $L\left\{\int_0^t f(u) du\right\}$  is

- A  $\int_s^\infty \bar{f}(u) du$  B  $\frac{\bar{f}(s)}{s}$   
 C  $-\frac{d}{ds}\bar{f}(s)$  D  $s\bar{f}(s)$
97.  $L^{-1}\left\{\frac{1}{s^2-4}\right\} = \underline{\hspace{2cm}}$
- A  $\cosh 2t$  B  $\cos 2t$   
 C  $\frac{1}{2}\cosh 2t$  D  $\sinh 2t$
98.  $\frac{\partial^2 u}{\partial x^2} = c^2 \frac{\partial u}{\partial t}$  is
- A one dimensional steady state heat equation B one dimensional transient heat equation  
 C two dimensional steady state head equation D two dimensional transient head equation
99. Which theorem represents the relationship between surface integration and volume integration?
- A Gauss divergence theorem B Stokes' theorem  
 C Green's theorem D None
100. Which is a direct method to find solution of linear simultaneous equations?
- A Gauss-Jacobi method B Gauss-Seidal method  
 C Gauss-Jordan method D Relaxation method

Seat No. \_\_\_\_\_

SUB: PHARMACY (PY)

Time: 1 Hour 40 minutes

**Instructions:**

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. Absorption involves movement of drug from :  
A Site of Application to site of action  
B Site of Administration to site of absorption  
C Site of Absorption to site of action  
D Site of Administration to extracellular compartment
2. Aprotic solvents act as excellent solvents because of their **(Select wrong answer)**  
A High dielectric constant  
B High polarizability  
C High Dipole moment  
D High Hydrogen Bonding
3. Drugs with large Volume of Distribution have  
A High Protein binding  
B High plasma half life  
C High plasma concentration  
D High tissue distribution
4. The HLB Scale of Classification of Surfactants was devised by  
A Davies  
B Draves  
C Griffith  
D Griffin
5. For a drug obeying 2 compartment model, plasma concentration declines  
A In zero order manner  
B In First order manner  
C Exponentially  
D Bi-exponentially
6. The limit for weight variation of a tablet weighing 200 mg as per I. P. is  
A 2.5 %  
B 5%  
C 7.5%  
D 10%
7. The disintegration test of dispersible tablet as per I. P. should be carried out at  
A 36 to 38 °C  
B 25 to 35 °C  
C 15 to 25 °C  
D 28 to 32 °C
8. As per ICH guidelines, the storage conditions for Intermediate Stability Testing of Finished Pharmaceutical Product should be:  
A 30 °C / 50 % RH  
B 30 °C / 65 % RH  
C 40 °C / 75 % RH  
D 25 °C / 60 % RH
9. Ophthalmic products are said to pass the particle size test (I.P.) if it **does not contain** ANY particle above:  
A 10 µm  
B 25 µm  
C 50 µm  
D 100 µm
10. Amber colored glass can provide protection against light rays of following wavelength  
A 200 nm  
B 300 nm  
C 400 nm  
D 500 nm
11. The coating defect associated with inadequate spreading of coating solution in coated tablets is  
A cracking  
B blooming  
C orange peeling  
D blistering
12. Most commonly used plasticizer for soft gelatin capsules amongst the following is

- A Dibutyl phthalate BC PEG 200  
 C Propylene Glycol D Sorbitol

13. The value of Carr's index indicating good flow should be :  
 A > 30 % B < 15 %  
 C between 15 to 25 % D between 20 to 30 %

14. Sodium citrate is used in Calamine lotion as:  
 A buffering agent B complexing agent  
 C peptizing agent D sequestering agent

15. ARE method of Urinary Excretion is also called:  
 A Method of Residuals B Sigma Minus Method  
 C Actual Rate of Excretion D Wagner Nelson Method

16. Rotosort is used during manufacturing and Quality control of  
 A Tablets B Capsules  
 C Injections D Ointments

17. A chlorinated, non-caloric Artificial sweetener is  
 A Aspartame B Sucralose  
 C Acesulfame D Stevia

18. According to I.P., store in Cold refers to  
 A Store in freezer B Store between 0 to 4 ° C  
 C Store between 2 to 8 ° C D Store between 8 to 25 ° C

19. Two surfactants with respective HLB values of A = 15 and B = 5 are to be used for preparing an O/W emulsion.  
 The required ratio of the surfactants (A : B) to obtain final emulsion of HLB = 11 is  
 A 1 : 2 B 2 : 1  
 C 3 : 2 D 2 : 3

20. A high boiling solvent that is also used as plasticizer in nail lacquers is  
 A Butyl stearate B Ethyl acetate  
 C Acetic acid D Toluene

21. A Cosmetic Cream usually existing as a water in oil emulsion is  
 A Make up cream B Vanishing Cream  
 C Cleansing Cream D Foundation Cream

22. Aluminium Magnesium Silicate is used in Dentifrices as  
 A Foaming and Wetting Agent B Wetting and Cleaning Agent  
 C Cleaning and Binding agent D Binding and Abrasive agent

23. Desired Melting point of Lipstick should be between  
 A 30 to 40 ° C B 40 to 50 ° C  
 C 50 to 60 ° C D 60 to 70 ° C

24. Dimethicone is used in Shampoos as  
 A Foam booster B Conditioner  
 C Cleansing agent D Stabilizer

25. An example of directly compressible Sucrose is  
 A Di-Pac B Tablettose  
 C Pharmatose D Prosolv

26. The isoelectric point of Type A Gelatin is around  
 A pH 4 B pH 5



C pH 7

D pH 9

27. The most appropriate labelling requirement for storage of Aluminum hydroxide Gel I.P. is  
A Store in Freezer B Store in Cold place  
C Store in Cool place D Store in Refrigerator
28. HDPE containers are sterilized by:  
A Dry heat Sterilization B Moist heat sterilization  
C Radiation sterilization D All of the above
29. The biological half life of a drug whose Volume of Distribution is 60 L and Clearance is 1.396 L/min will be  
A 30 Min B 60 min  
C 120 min D 240 min
30. If the Adult dose of a drug is 200 mg, then the dose for a child weighing 14 kg would be:  
A 10 mg B 20 mg  
C 40 mg D 50 mg
31. Xenon arc lamp is the source of light in  
A Spectrofluorimeter B Flame Photometer  
C IR spectrometer D Calorimeter
32. The chemical shift value is  
A Not proportional to field strength B Proportional to field strength  
C Proportional to the total no. of protons D Ratio of number of protons in each group
33. Cobalt is a constituent of  
A Folic acid B Vitamin B12  
C Niacin D Biotin
34. Group transferring Co-enzyme is  
A NADP<sup>+</sup> B NAD<sup>+</sup>  
C CoA D FAD<sup>+</sup>
35. Michaelis-Menten equation is used to explain the effect of substrate concentration on  
A Carbohydrate B Protein  
C Lipid D Enzyme
36. The tear secretion contains an antibacterial enzyme known as  
A Zymase B Diastase  
C Lysozyme D Lipase
37. Aspartame is a combination of  
A Phenylalanine and Aspartic acid B Tyrosine and Aspartic acid  
C Aspartic acid and Glutamic acid D Phenylalanine and methyl ester of Aspartic acid
38. Ketone bodies produced in liver include  
A Acetone B Acetoacetate  
C D-β hydroxy butyrate D All of the above
39. The main carbohydrate in blood is  
A d-fructose B Mannitol  
C d-glucose D l-glucose
40. Acetazolamide can be synthesized from one of the following intermediates

- A 5-amino-2-mercapto-1,3-thiazole      B 5-amino-2-mercapto-1,2,4-thiadiazole  
C 5-amino-2-mercapto-1,3,4-thiadiazole      D 5-amino-2-mercapto-1,3,4-tetrazole
41. Acidity of Ascorbic acid is due to the presence of  
A Free carboxylic group      B A number of hydroxyl groups  
C Enolic groups      D None of the above
42. Prazepam differs in structure from Diazepam  
A N-methyl group      B N-cyclo propyl group  
C N-cyclo propyl methyl group      D N-propyl group
43. Introduction of OH group at 3-position in benzodiazepine causes  
A Increased activity      B Loss in activity  
C Lowering of activity      D None of the above
44. Which of the following ring is present in Cimetidine  
A Thiazole      B Imidazole  
C Pyrrole      D Furan
45. Captopril contains which of the following amino acid residue  
A Proline      B Leucine  
C Valine      D Isoleucine
46. Naltrexone is a morphine  
A Agonist      B Antagonist  
C Partial antagonist      D All of the above
47. Hydralazine is related to  
A Venous dilators      B Balanced venous dilators  
C Arterial dilators      D  $\text{Ca}^{2+}$  channel blocker
48. Chemically Primaquine is  
A 8-[4-amino-1-methyl butyl amino] -6-methoxy quinoline      B 8-[4-amino-1-ethyl butyl amino] -6-methoxy quinoline  
C 8-[2-amino-1-methyl butyl amino] -6-methoxy quinoline      D 8-[2-amino-1-ethyl butyl amino] -6-methoxy quinoline
49. Metabolite of spironolactone is  
A Aldosterone      B Canrenone  
C Corticosteroid      D Pregnenolone
50. Atropine on hydrolysis with barium hydroxide gives  
A Tropanol and tropic acid      B Scopine and tropic acid  
C Ecgonine and Benzoic acid      D Benzyl ecgonine and methanol
51. Silver – silver chloride electrode consists of  
A Silver wire coated with calomel      B Silver wire coated with potassium chloride  
C Silver wire coated with silver chloride      D Platinum wire coated with silver chloride
52. Ion exchange capacity of a resin is dependent on  
A The total molecular weight of resin      B The total number of ion active groups  
C Length of the ion exchange resin      D Solubility of ion exchange resin
53. Gel chromatography separates out the solute molecules on the basis of  
A Size of solute      B Relative affinity  
C Chemical nature      D Their absorption power
54. Nernst glow is a mixture of

- A Zirconium, Yttrium, Thorium      B Radium, Thorium  
C Tungsten, Zirconium      D None of the above
55. Diffusion current in polarography is defined by  
A Curve      B Absorptivity  
C Electrode      D Dilution
56. The parent peak of benzene appears of m/z  
A 75      B 77  
C 78      D 51
57. Hydrogen deuterium discharge lamp is used in  
A IR spectrophotometer      B UV spectrophotometer  
C Polarometer      D Gas Liquid chromatography
58. o, m, p - isomers can be differentiated by  
A Nuclear constant      B Coupling constant  
C Bathochromic shift      D Chemical shift
59. The solvent not used in IR spectroscopy is  
A  $\text{CHCl}_3$       B  $\text{CCl}_4$   
C  $\text{CS}_2$       D  $\text{H}_2\text{O}$
60. Bragg's equation is given by  
A  $n\lambda = 2d\sin\theta$       B  $nd = 2\lambda\sin\theta$   
C  $n = 2\lambda d\sin\theta$       D None of the above
61. Rosettes of Calcium oxalate crystals are found in \_\_\_\_\_.  
A Digitalis      B Senna  
C Hyocyamus      D Vasaka
62. Mace found on seeds of *Myristica fragrans* is \_\_\_\_\_.  
A Arillus      B Caruncle  
C Strophiole      D Awn
63. Method for quantification of the anthraquinone glycoside content of drugs specified by the European Pharmacopoeia is \_\_\_\_\_.  
A Gravimetry      B Titrimetry  
C Spectrophotometry      D Gas Chromatography
64. Teniposide is anti-leukemic natural product derived from \_\_\_\_\_.  
A Lignans of *Schizandra chinensis*      B Flavanolignans of *Silybum marianum*  
C Lignans of *Podophyllum peltatum*      D Neolignans of *Piper futokadsura*
65. Pungency of ginger is destroyed by boiling with 2 % solution of \_\_\_\_\_.  
A Sodium carbonate      B Hydrochloric acid  
C Potassium hydroxide      D Acetic acid
66. Sessile glandular trichomes are seen in \_\_\_\_\_.  
A Digitalis      B Belladonna  
C Hyocyamus      D Vasaka
67. Excessive consumption of liquorice leads to \_\_\_\_\_.  
A Dryness in mouth      B Drowsiness  
C Hypokalemic myopathy      D Anorexia nervosa
68. \_\_\_\_\_ can be obtained by microbial oxidation of Eugenol.  
A Vanillin      B Vitamin  
C Thymol      D Menthol
69. Paper impregnated with turmeric extract is used for identification of \_\_\_\_\_.  
A Protocatechuic acid      B Gallic acid  
C Boric acid      D Ferulic acid

70. Lycopodium spore method is an important analytical technique for \_\_\_\_\_.  
 A Woody drugs B Powdered drugs  
 C Whole Drugs D Semisoild Drugs
71. \_\_\_\_\_ of the following plant species are steroid sources for industry.  
 A *Dioscorea composita* B *Glycyrrhiza glabra*  
 C *Ipomoea purga* D *Smilax regelii*
72. Vinpocetine (CavintonR) a semi-synthetic derivative of vincamine is used in the treatment of \_\_\_\_\_.  
 A Gout B Arthritis  
 C Senile dementia D Jaundice
73. \_\_\_\_\_ is toxalbumin found in castor seeds.  
 A Casein B Ricin  
 C Amandin D Abrin
74. The term St Antony's fire is used for \_\_\_\_\_.  
 A The production of ergot B The toxicity of ergot  
 C The toxicity of morphine D The production of poppy
75. The binomial system of classification was developed by \_\_\_\_\_.  
 A Malthus B Wallace  
 C Linnaeus D Darwin
76. \_\_\_\_\_ natural product is developed as an antimalarial.  
 A Pyrimethamine B Paludrine  
 C Halofantrine D Artemisinin
77. \_\_\_\_\_ is teratogenic.  
 A Kurchi B Ipecac  
 C Veratrum D Ephredra
78. Adulteration in Honey with Invert sugar can be detected by \_\_\_\_\_ test.  
 A Molisch's test B Fiehe's Test  
 C Seliwanoff's test D Benedict's test
79. \_\_\_\_\_ is an example of a Protoalkaloid.  
 A Ephedrine B Quinine  
 C Atropine D Aconitine
80. Polyploidy is \_\_\_\_\_.  
 A Addition of one chromosome B Multiplication of entire chromosome set  
 C Submicroscopic changes in DNA D Gross structural changes
81. In most cases the drugs that cross biological membranes are primarily by:  
 A Passive diffusion B Facilitated diffusion  
 C Active transport D Pinocytosis
82. Which of the following property of the drug is related to lower volume of distribution:  
 A. High lipid solubility B. Low ionisation at physiological pH values  
 C. High plasma protein binding D. High tissue binding
83. Which of the following undergo extensive first-pass metabolism in the liver:  
 A. Phenobarbitone B. Propranolol  
 C. Phenylbutazone D. Theophylline
84. Which of the following is true for receptor agonists:  
 A Affinity but no intrinsic activity B. Intrinsic activity but no affinity  
 C. Affinity and positive intrinsic activity D. Affinity and negative intrinsic activity.

85. Which of the following can be considered as type B (unpredictable) adverse drug reaction:  
 A. Side effect B. Toxic effect  
 C. Idiosyncrasy D. Physical dependence
86. Acetylcholine does not increase the secretion of:  
 A. Tear B. Bile  
 C. Pancreatic juice D. Sweat
87. Atropine produces the following actions **except**:  
 A. Tachycardia B. Mydriasis  
 C. Dryness of mouth D. Urinary incontinence
88. Which of following drugs is a selective  $\alpha_2$  adrenoceptor antagonist:  
 A. Prazosin B. Phentolamine  
 C. Yohimbine D. Clonidine
89. Major difference between Labetalol and Propranolol is  
 A. It has additional  $\alpha_1$  blocking property B. It is a selective  $\beta_1$  blocker  
 C. It does not undergo first pass metabolism D. All of the above
90. Which one of the following 5-HT receptor is **not** a G protein coupled receptor:  
 A. 5-HT<sub>1</sub> B. 5-HT<sub>2</sub>  
 C. 5-HT<sub>3</sub> D. 5-HT<sub>4</sub>
91. Which of the following is a selective 5HT<sub>4</sub> antagonist  
 A. Buspirone B. Sumatriptan  
 C. Cisapride D. Clozapine
92. Aspirin's anti-platelet activity is due to  
 A. Thromboxane A<sub>2</sub> B. 5-Hydroxytryptamine  
 C. Platelet activating factor D. Prostacyclin
93. Which one of the following anti-gout drug is **not** uricosuric  
 A. Probenecid B. Phenylbutazone  
 C. Sulfapyrazone D. Allopurinol
94. Which of the following is not a bronchodilator  
 A. Ipratropium bromide B. Theophylline  
 C. Formoterol D. Sodium cromoglycate
95. Octreotide is a synthetic analogue of:  
 A. Prolactin B. Growth hormone  
 C. Somatostatin D. Gonadotropin releasing hormone
96. Gynaecomastia can be reduced with which one of the following drugs:  
 A. Chlorpromazine B. Cimetidine  
 C. Bromocriptine D. Metoclopramide
97. The mechanism by which carbimazole acts is:  
 A. Iodide trapping B. Oxidation of iodide  
 C. Proteolysis of thyroglobulin D. Synthesis of thyroglobulin protein
98. The Insulin receptor belongs to which one of the following class  
 A. Ion channel regulating receptor B. Tyrosine protein kinase receptor  
 C. G-protein coupled receptor D. Nuclear Receptor
99. Mechanism of action of metformin involves  
 A. Releasing insulin from pancreas B. Suppressing gluconeogenesis and glucose output from liver  
 C. Up regulating insulin receptors D. Inhibiting degradation of insulin
100. Corticosteroids after long term therapy should be withdrawn in tapered manner because:

- A. Corticosteroids produce psychological dependence  
B. Abrupt withdrawal may reactivate the underlying disease  
C. Abrupt withdrawal produces rebound hypertension  
D. Abrupt withdrawal may result in severe respiratory depression

**Instructions:**

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

**Read the Passage given below carefully and answer the questions No: 1 to 5 by choosing the correct option on the basis of your Comprehension of the same:**

What distinguishes humans from animals? For some it is language, for others it is the altruistic willingness to help other members of the species. However, this kind of altruism seems to exist in the animal world as well.

Researchers working with Chrisophe Boesch at the Max Planck Institute for Evolutionary Anthropology in Leipzig observed that West African chimpanzees adopt orphaned young, even though they are not related to them. Several animals lavished care on a juvenile for several years. Surprisingly, half of these adoptive parents were male.

This behaviour is thought to be encouraged by the pressure of leopards, with whom the West African chimpanzees shared their habitat. The constant threat from the big cats seems to have encouraged cohesion and solidarity within the group. Accordingly, the scientists observed more chimpanzee adoptions in West Africa's Tai National Park than in East Africa.

Wild Chimpanzees appear to be more prepared to help than those living in captivity. In zoos, chimpanzees cooperate with other members of the group to only a very limited extent. 'Our observations show that altruism in wild chimpanzees is much more widespread than studies of chimpanzees in zoos would suggest' concludes Chrisophe Boesch.

1. Which of the following does the author want to establish by suggesting that animals are altruistic?

A That humans are beginning to behave like animals	B That animals are beginning to behave like animals
C That animals too, like humans, share empathy with fellow creatures	D That humans are not so empathetic to their fellow creatures as animals are
2. While discovering the adoptive streak in animals, what surprises the author is that...

A Even chimpanzees adopt orphan juveniles of big cats	B Even male chimpanzees adopt juveniles of other species
C Even big cats orphan juveniles of chimpanzees	D Even female chimpanzees adopt juveniles of other species
3. About the recently discovered altruistic zeal in chimpanzees, all except the following can be inferred from the passage.

A Chimpanzees living in the wild are more altruistic than those in cages.	B Chimpanzees adopt orphans that are even unrelated to them.
---	--

- C Chimpanzees found in West African forests are more altruistic than those found anywhere else. D Chimpanzees found in the Tai National Park in West Africa are observed to be more altruistic than those found in East Africa.
4. Which of the following is not a reason for the altruistic behaviour observed in West African chimpanzees?
- A The presence of constant threat from leopards in their environment B The presence of natural altruistic willingness to help others
- C The presence of a natural sense of competition in animals D The presence of a natural environment that stimulates such a behaviour in them
5. In the expression 'this behavior is thought to be encouraged.....', the word 'this' refers to which of the following.
- A That chimpanzees are not much distinguished from humans B That chimpanzees exhibit a sense of altruism existing in them
- C That chimpanzees do not behave as strictly according to their gender as humans do D That sexual limitations do not stop a male chimpanzee from being altruistic and adoptive in behaviour
6. I met \_\_\_\_\_ European yesterday, who seemed to be very friendly and generous.
- A a B an
- C the D Neither of A,B,C
7. They \_\_\_\_\_ for hours in the lab until the peon came to lock the room.
- A has been working B had been working
- C was working D were working
8. They \_\_\_\_\_ done better in exam if they have not skipped too many classes.
- A can have B could have
- C should have D will have
9. If the Active structure is:  
Somebody was cleaning the room when I arrived.  
What is the correct Passive structure?  
Passive: The room \_\_\_\_\_ when I arrived.
- A is being cleaned B was clean
- C was being cleaned D has been cleaned
10. This room is \_\_\_\_\_ larger than the other.
- A more B very
- C most D much
11. The child was \_\_\_\_\_ stroke the dog.
- A afraid of B afraid to
- C afraid D to afraid
12. If I \_\_\_\_\_ go to the party, they would be offended.
- A shouldn't B wouldn't
- C don't D didn't
13. If I \_\_\_\_\_ you, I would not buy that car.
- A am B are
- C was D were
14. I didn't get the job \_\_\_\_\_ having all the necessary qualifications.







43. What is the minimum prescribed width of a footpath in urban areas?

C Total Disaster Report      D None of them

A 1.5m      B 1.0m

C 2.0m      D 2.5m

44. Which of the city has the largest Slum in India

A Patna      B Surat

C Mumbai      D Kanpur

45. AMRUT is the Central Government Schemes provides supports for which of the following?

A Urban Development      B Rural Development

C Industrial Development      D Infrastructure Development

46. Planning Authority of the large urban centers are called?

A Urban Local Bodies      B Urban Development Authorities

C Urban Development Department      D None of them

47. Which of the following is NOT part of the 3 tier urban governance system in India?

A Municipal Council      B Municipal Corporation

C Nagar Panchayat      D District Panchayat

48. Which agency is authorized to levy the property tax in a city?

A ULB      B Office of the Collector

C Revenue Department      D None of them

49. Who is the Minister of Housing and Urban Affairs of the Government of India?

A Smriti Irani      B Hardeep Singh Puri

C Venkiya Naidu      D Rajiv Pratap Rudi

50. When the Gujarat Town Planning and Urban Development Act was passed?

A 1976      B 1975

C 1977      D 1960

51. The first symbol for the Indian rupees was officially approved in .....

A 2012      B 2013

C 2009      D 2010

52. Portuguese navigator “Vasco de Gama” arrived in India in which year?

A 1458      B 1498

C 1857      D 1820

53. M. S. Dhoni, an Indian cricketer has been given honorary rank of Lieutenant Colonel in the Parachute Regiment in which year?

A 2012      B 2011

C 2014      D 2015

54. At present, who is the Minister of youth affairs and sports in Government of India?

A Rajyavardhan Singh Rathore      B Kiren Rijiju

C Parshottam Rupala      D Harsimrat Kaur Badal

55. Which is the capital of Chhattisgarh?

- A Bialspur  
 C Ranchi  
 B Raipur  
 D Dehradun

56. The time difference between I. S. T. and G. S. T. is :

A 5 ½ hours  
 C 12 ½ hours  
 B 8 ½ hours  
 D 9 hours

57. Who was the first Indian to make a movie?

A Ardeshir Irani  
 C H. S. Bhatavadekar  
 B D. G. Phalke  
 D Raj Kapoor

58. India switched to the decimal system of coinage in:

A 1947  
 C 1950  
 B 1957  
 D 1962

59. Lord Buddha delivered his first sermon at:

A Bodh Gaya  
 C Sarnath  
 B Sanchi  
 D Kushinagar

60. Holding of elections for the village Panchayat is decided by

A The collector  
 C The central government  
 B The election commission  
 D The state Government

61. Author of the Book “Good Earth” is:

A M. Mitchell  
 C N. Angell  
 B C. Dickens  
 D P. S. Buck

62. Nasik is situated on the bank of the river :

A Krishna  
 C Godavari  
 Cauvery  
 Narmada

63. When a ship crosses the International Date Line from West to East:

A It losses one day  
 C It losses a half day  
 B It gains one day  
 D It gains a half day

64. Gandhi Irwin Pact was signed in:

A 1930  
 C 1925  
 B 1931  
 D 1940

65. Osteology is the study of :

A Cell formation  
 C Kidney  
 B Nose  
 D Bones

66. Who was the last Mugal emperor of India?

A Akbar  
 C Bahadur shah Zafar  
 B Shah Jahan  
 D Jahangir

67. What is the name of the Indian scientist who has won the Nobel Prize in “Physics” in 1930?

A Sir C. V. Raman  
 B S. Chandrashekhhar



- Page 8 of 10

P, Q, R and S.

- I. P always beats Q
- II. R always beats S
- III. S loses to P only sometimes
- IV. R always loses to Q

Which of the following can be logically inferred from the above statements?

- (i) P is likely to beat all the three other players.
- (ii) S is the absolute worst player in the set.

- |            |                        |
|------------|------------------------|
| A Only     | B Only                 |
| C And (ii) | D Neither (i) nor (ii) |

90. If 'relftaga' means carefree, 'otaga' means careful and 'fertaga' means careless, which of the following could mean 'aftercare'?

- |           |           |
|-----------|-----------|
| A Zentaga | B Tagafer |
| C Tagazen | D Relffer |

91. Find the odd one from the following group: WEKO, IQWA, FNTX, NVBD

- |        |        |
|--------|--------|
| A WEKO | B IQWA |
| C FNTX | D NVBD |

92 to 96 Directions (92 to 96): Given below are pairs of events 'X' and 'Y'. You have to read both the events 'A' and 'B' and decide their nature of relationship. You have to assume that the information given in 'A' and 'B' is true and you will not assume anything beyond the given information in deciding the answer.

Mark answer:

- (A) If 'X' is the effect and 'Y' is its immediate and principle cause.
- (B) If 'X' is the immediate and principle cause and 'Y' is its effect.
- (C) If 'X' is an effect but 'Y' is not its immediate and principle cause.
- (D) If 'Y' is an effect but 'X' is not its immediate and principle cause.

92. (X) Prices of gold have gone up in the local market.

(Y) India has won several prizes in design of gold ornaments.

93. (X) Today, the prime ministers of country "P" and "Q" have decided to take steps to improve bilateral relations.

(Y) Next week a committee of Foreign Ministers and Senior Officers of country "P" and "Q" will work out further steps to improve the relationship.

94. (X) Recently the prices of the personal computers have come down.  
(Y) Some school children are showing keen interest in learning computer.
95. (X) This year Bank “M” has celebrated its silver jubilee.  
(Y) More customers are getting attracted to the market branch of Bank M.
96. (X) Recently the traffic jams on M. G. Road of city “Z” are not only reduced but the traffic has also become manageable.  
(Y) The flyover on M. G. Road of city “Z” has recently been made operational and the number of traffic police personnel has been increased.
97. Which of the following word can be formed from the letters of “BLANDISHMENT”
- |         |         |
|---------|---------|
| A BOARD | B METAL |
| C SHAPE | D CRASH |
98. Mira starts at point T, walks straight to point U which is 4ft away. She turns left at 90° and walks to W which is 4 ft away, turns 90° right and goes 3 ft to P, turns 90° right and walks 1 ft to Q, turns left at 90° and goes to V, which is 1 ft away and once again turns right 90° and goes to O, 3ft away. What is the distance between T and O?
- |        |        |
|--------|--------|
| A 4 ft | B 5 ft |
| C 7 ft | D 8 ft |
99. Find the odd one out from the following: Tortoise, Crab, Frog, Fish
- |        |            |
|--------|------------|
| A Fish | B Frog     |
| C Crab | D Tortoise |
100. How many triangles are there in this figure:



- |     |     |
|-----|-----|
| A 6 | B 7 |
| C 8 | D 9 |