

Section – Mathematics

1. If $z \neq 0$ be a complex number such that $\left|z - \frac{1}{z}\right| = 2$, then the maximum value of $|z|$ is

A) $\sqrt{2}$

C) $\sqrt{2} - 1$

B) 1

D) $\sqrt{2} + 1$
2. The conjugate of a complex number is $\frac{1}{i-1}$ then that complex number is

A) $\frac{-1}{i-1}$

C) $\frac{1}{i+1}$

B) $\frac{-1}{i+1}$

D) $\frac{1}{i-1}$
3. If $f(x)$ is a quadratic equation such that $f(1) + f(2) = 0$, and -1 is a root of $f(x) = 0$ then the other root of $f(x) = 0$ is

A) $\frac{-5}{8}$

C) $\frac{5}{8}$

B) $\frac{-8}{5}$

D) $\frac{8}{5}$
4. If x is real the maximum value of $\frac{3x^2+9x+17}{3x^2+9x+7}$ is

A) $\frac{1}{4}$

C) 1

B) 41

D) $\frac{17}{7}$
5. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8, without repetition, is

A) 120

C) 216

B) 72

D) 192
6. The positive integer n so that $\lim_{x \rightarrow 1} \left(\frac{x^n - 3^n}{x - 3} \right) = 108$ is

A) 1

C) 3

B) 2

D) 4
7. The value of $\lim_{x \rightarrow 0} (\sin x)^{\tan x}$ is

A) 1

C) $1/e$

B) $1/2$

D) e
8. If $\frac{{}^{n+2}C_6}{{}^{n+2}P_2} = 11$, then n satisfies the equation

A) $n^2 + n - 110 = 0$

C) $n^2 + 3n - 108 = 0$

B) $n^2 + 2n - 80 = 0$

D) $n^2 + 5n - 84 = 0$
9. If the 10th term of an AP is $1/20$ and its 20th term is $1/10$, then the sum of its first 200 terms is

A) 50

C) 100

B) $50 \frac{1}{4}$

D) $100 \frac{1}{2}$
10. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (1,1) and (2,4) in the ratio 3:2, then k is equal to

A) $\frac{29}{5}$

B) 5

C) 6

D) $\frac{11}{5}$

11. If $A = \begin{pmatrix} 2-k & 2 \\ 1 & 3-k \end{pmatrix}$ is a singular matrix, then the value of $5k - k^2$ is

A) 0

B) 6

C) -4

D) 4

12. If $\tan x = \frac{b}{a}$, then the value of $a \cos 2x + b \sin 2x$ is

A) a

B) a - b

C) a + b

D) b

13. If $\tan A$ and $\tan B$ are the roots of $x^2 - ax + b = 0$, then the value of $\sin^2(A + B)$ is

A) $\frac{a^2}{a^2 + (1-b^2)}$

B) $\frac{a^2}{a^2 + b^2}$

C) $\frac{a^2}{(a+b)^2}$

D) $\frac{b^2}{a^2 + (a-b)^2}$

14. The equation of the normal of $x^2 + y^2 - 2x + 4y - 5 = 0$ at (2, 1) is

A) $y = 3x - 5$

B) $2y = 3x - 4$

C) $y = 3x + 4$

D) $y = x + 1$

15. Let $P(x)$ be a quadratic polynomial such that $P(0) = 1$. If $p(x)$ leaves remainder 4 when divided by $x - 1$ and it leaves remainder 6 when divided by $x + 1$; then

A) $P(2) = 11$

B) $P(2) = 19$

C) $P(-2) = 19$

D) $P(-2) = 11$

16. The number of ways of selecting 15 teams from 15 men and 15 women, such that each team consists of a man and a woman, is

A) 1120

B) 1840

C) 1960

D) 1240

17. Let $f(x) = x - [x]$ then $x \in \mathbb{R}$ then $f(1/2)$ is

A) $\frac{3}{2}$

B) 1

C) 0

D) -1

18. The value of $\lim_{n \rightarrow \infty} \left(\frac{1+2^3+3^3+\dots+n^3}{n^4} \right)$ is equal to

A) 0

B) 2

C) $\frac{1}{3}$

D) $\frac{1}{4}$

19. If $x^y y^x = 16$, then the value of $\frac{dy}{dx}$ at (2, 2) is

A) 0

B) 1

C) -1

D) 2

20. The area under the curve $y = x^2$ and the lines $x = -1$, $x = 2$ and X-axis is

A) 3 sq. units

B) 5 sq. units

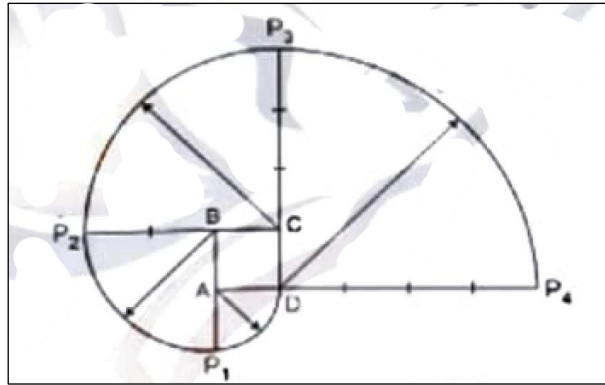
C) 7 sq. units

D) 9 sq. units

21. The total area enclosed by $y = |x|$, $|x| - 1$ and $y = 0$ is
 A) 1 sq. unit
 B) 2 sq. unit
 C) 3 sq. unit
 D) 4 sq. unit
22. If $\left(\frac{n}{4}\right)$, $\left(\frac{n}{5}\right)$, and $\left(\frac{n}{6}\right)$ are in A.P., then n can be
 A) 9
 B) 14
 C) 11
 D) 12
23. The sum of $\sum_{n=1}^{21} \frac{3}{(4n-1)(4n+3)}$ is equal to
 A) $\frac{7}{87}$
 B) $\frac{7}{29}$
 C) $\frac{14}{87}$
 D) $\frac{21}{29}$
24. If $A(\theta) = \frac{1}{\tan \theta} \tan \theta$ and $AB = I$, then $(\sec^2 \theta) B$ is equal to
 A) $A(\theta)$
 B) $A(\theta/2)$
 C) $A(-\theta)$
 D) $A(-\theta/2)$
25. If $A = \begin{pmatrix} x & -2 \\ 3 & 7 \end{pmatrix}$ and A^{-1} and $A^{-1} = \begin{pmatrix} 7/34 & 1/17 \\ -3/34 & 2/17 \end{pmatrix}$, then the value of x is
 A) -3
 B) 3
 C) 4
 D) -4
26. The maximum value of $f(x) = \sin x (1 + \cos x)$ is
 A) $\sqrt[3]{3}/4$
 B) $\sqrt[3]{3}/2$
 C) $\sqrt[3]{3}$
 D) $\sqrt{3}$
27. The value of $\frac{1}{\cos 290^\circ} + \frac{1}{\sqrt{3} \sin 250^\circ}$ is
 A) $\frac{\sqrt{3}}{4}$
 B) $\frac{4}{\sqrt{3}}$
 C) $\frac{2}{\sqrt{3}}$
 D) $\frac{\sqrt{3}}{2}$
28. If the points $(3q, 0)$, $(0, 3p)$ and $(1, 1)$ are collinear, then which one of the following is correct?
 A) $\frac{1}{p} + \frac{1}{q} = 0$
 B) $\frac{1}{p} + \frac{1}{q} = 1$
 C) $\frac{1}{p} + \frac{1}{q} = 3$
 D) $\frac{1}{p} + \frac{3}{q} = 1$
29. If the line $y = 7x - 25$ meets the circle $x^2 + y^2 = 25$ at points A and B , then the distance between A and B is
 A) $\sqrt{10}$
 B) 10
 C) $5\sqrt{2}$
 D) 5
30. The number of terms in the expansion of $((a + b + c)^{10})$ is
 A) 55
 B) 66
 C) 21
 D) 11

Section – Basic of Computer Science

31. Which of the following is not a type of computer code?
- A) EDIC
 - B) BCD
 - C) ASCII
 - D) EBCDIC
32. What is Workbook in Excel?
- A) A single worksheet
 - B) A collection of Charts
 - C) A temporary File
 - D) An Excel file containing one or more worksheets
33. Indicate which of the following is not true about an interpreter
- A) Interpreter is a kind of translator
 - B) Interpreter generates an object code from the source code
 - C) Interpreter analyses source code every time it executed
 - D) interpreter executes line by line
34. A set of rules followed by each computer present on a network is called
- A) Protocol
 - B) HTTP
 - C) Domain
 - D) Web
35. Which Unix command is used for listing files in the current directory?
- A) List
 - B) ls
 - C) wc
 - D) ps
36. What is the full form of FAT?
- A) File Attribute Table
 - B) Format Access Term
 - C) File Allocation Table
 - D) Format allocation Table
37. What is the shortcut key used to detect spelling and grammar errors in MS-Word?
- A) Shift +F7
 - B) Ctrl +F7
 - C) Alt +F7
 - D) F7
38. The origin of the internet was developed from the concept of
- A) Microsoft
 - B) IBM
 - C) ARPANET
 - D) Web
39. Convert $(52)_{16}$ into its decimal equivalent
- A) 28
 - B) 83
 - C) 80
 - D) 82
40. In MS-Power Point, which menu can you find features like slide design, slide layout etc?
- A) Insert Menu
 - B) Format Menu
 - C) Tools Menu
 - D) Slide Show Menu



- A) Involute
- C) Spiral

- B) Cycloid
- D) Epicycloids

50. The equation $y^2 = 4x$ represents

- A) Circle
- C) Parabola

- B) Straight line
- D) Hyperbola

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Section – Chemical Engineering

51. During washing of cake
- A) All resistances remain constant
 - B) All resistances increase
 - C) All resistances decrease
 - D) The filter medium resistance is the most important
52. Sorting classifier use a sink-and-float method to separate particles of different densities. The separation
- A) Depends on the particle size
 - B) Depends on the difference in terminal velocities
 - C) Depends on the difference in the densities of the particles
 - D) Depends on the centrifugal force
53. The thicker the insulation the less is the total heat lost. This statement is
- A) always true for flat insulation only
 - B) always true for curved insulation only
 - C) always true for both flat and curved insulation
 - D) not true for both flat and curved insulation
54. For a blackbody, the wavelength at which the maximum monochromatic emissive power occurs is
- A) independent of the absolute temperature of the blackbody
 - B) direct proportional to absolute temperature of the blackbody
 - C) inversely proportional to the absolute temperature of the blackbody
 - D) proportional to the fourth power of the absolute temperature of the blackbody
55. Gypsum is added to clinker during cement manufacture to
- A) Decrease the rate of setting of cement
 - B) Make the cement impervious
 - C) Bind the particles of calcium silicate
 - D) to facilitate the formation of colloidal gel
56. Ideal refrigeration cycle is
- A) same as carnot cycle
 - B) Same as reverse carnot cycle
 - C) Dependent on the refrigerant's properties
 - D) The least efficient of all refrigeration processes
57. A liquid/gaseous fuel containing hydrocarbons and high amount of sulphur is burnt with 40% excess air. The fuel gas still contains large amount of carbon monoxide. This may be due to
- A) The presence of large quantity of hydrogen in the fuel
 - B) Low calorific value of the fuel
 - C) High sulphur content in the fuel
 - D) Lack of thorough mixing of fuel with air
58. Babbit metal (used for making bearings) comprises of
- A) Mainly tin (85%) and lead
 - B) Saw dust and iron dust mixture
 - C) Zinc and aluminium
 - D) Copper and aluminium

59. 25 percent cut segmental baffle means that the baffle
- A) Height is 75% of the I.D. of the shell
 - B) Height is 25% of the I.D. of the shell
 - C) Spacing is 75% of its height
 - D) Width is 25% of its height
60. The presence of sodium sulphate in pulp
- A) makes the pulp bleachability easier
 - B) poor strength properties of paper
 - C) make the pulp bleaching poor
 - D) none of the above
61. Rancidity of oil can be reduced by
- A) decoloration
 - B) hydrogenation
 - C) oxidation
 - D) purification
62. Crushing efficiency is the ratio of
- A) Surface energy created by the crushing to the energy absorbed by the solid
 - B) The energy absorbed by the solid to that fed to the machine
 - C) The energy fed to the machine to the surface energy created by the crushing
 - D) The energy absorbed by the solid to the surface energy created by the crushing
63. In continuous filtration (at a constant pressure drop), filtrate flow rate varies inversely as the
- A) Square root of the velocity
 - B) Square of viscosity
 - C) Filtration time only
 - D) Washing time only
64. For laminar flow of filtrate through the cake deposited on septum which of the following will be valid?
- A) Kozney - Karman equation
 - B) Leva's equation
 - C) Black-Plummer equation
 - D) None of these
65. The most efficient equipment for removal of sub-micron dust particles from blast furnace gas is
- A) venture atomiser
 - B) gravity settling chamber
 - C) electro-static precipitator
 - D) cyclone separator
66. In catalytic cracking
- A) gasoline obtained has very low octane number
 - B) pressure and temperature are very high
 - C) gasoline obtained has very high aromatic content
 - D) gasoline obtained has very high amount of gum forming compounds
67. A chemical reaction occurs when the energy of the reacting molecules is
- A) Less than the activation energy of the reaction
 - B) Equal to the activation energy of the reaction
 - C) More than the activation energy of the reaction
 - D) Equal to or more than the activation energy of the reaction
68. The rate of reaction of any component is a function of
- A) Temperature of the system only
 - B) Pressure of the system only
 - C) Composition of the component only
 - D) Temperature, pressure and composition
69. For the irreversible unimolecular-type first order reaction

- A) The fractional conversion at any time is same for constant volume systems and variable systems
- B) The fraction conversion at any time is more for constant volume systems than variable-volume systems
- C) The fractional conversion at any time is less for constant volume systems than variable-volume systems
- D) The concentration of reactant at any time is same for constant-volume systems and variable-volume systems.

70. The space velocity of 2hr^{-1} means

- A) That every two hours one reactor volume of feed at specified conditions is being treated by the reactor
- B) That two reactor volumes of feed at specified conditions are being fed into the reactor per hour
- C) That the actual reactor volume is double that of the optimum reactor volume
- D) That one-half reactor volume of feed at specified conditions are being fed into the reactor

71. The dew point of an unsaturated mixture of water vapour and air at constant temperature and pressure

- A) Does not change with change in absolute humidity
- B) Increases with increase in absolute humidity
- C) Decreases with increase in absolute humidity
- D) Decreases linearly with increase in absolute humidity

72. In a distillation operation the heat removed in cooler

- A) Remains unaffected with change in reflux ratio
- B) Increases with increase in reflux ratio
- C) Decreases with increase in reflux ratio
- D) And the heat required in reboiler decreases with increase in reflux ratio

73. Torr is equal to the pressure of

- A) 0.1 mm of Hg at 0°C in a standard gravitational field
- B) 1 mm of Hg at 0°C in a standard gravitational field
- C) 0.01 mm of Hg at 0°C in a standard gravitational field
- D) 0.001 mm of Hg at 0°C in a standard gravitational field

74. Compressed air from a container at normal temperature is allowed to escape suddenly through a hole made in the container the air inside

- A) Starts becoming hotter
- B) Starts becoming cooler
- C) Remains at the same temperature
- D) May become hotter or cooler depending upon the amount of water vapour present

75. Unsaturated air (with dry bulb temperature and dew point being 35°C and 18°C respectively) is passed through a water spray chamber maintained at 15°C . The air will be

- A) cooled and humidified
- B) cooled and dehumidified with increase in wet bulb temperature

- C) cooled at the same relative humidity
- D) cooled and dehumidified with decrease in wet bulb temperature

76. The term "approach" in a cooling tower refers to the difference in the temperature of the
- A) Cold water leaving the tower and the wet bulb temperature of the surrounding air
 - B) Hot water entering the tower and the wet bulb temperature of the surrounding air
 - C) Hot water entering and the cooled water leaving the cooling tower
 - D) none of these
77. Selection of material for thermocouple depends on the
- A) Depth of immersion in the hot fluid
 - B) Minimum and maximum temperature
 - C) Pressure and velocity condition of the fluid whose temperature is to be measured
 - D) None of these
78. Clayperon equation deals with
- A) Rate of change of vapour pressure with temperature
 - B) Effect of an inert gas on vapour pressure
 - C) Calculation of AF for spontaneous phase change
 - D) Temperature dependence of heat of phase transition
79. Which of the following denotes the effect of compressibility in fluid flow?
- A) Weber number
 - B) Mach number
 - C) Euler number
 - D) Reynolds number
80. For steady ideal fluid flow, the Bernoulli's equation states that the
- A) Velocity is constant along a stream line
 - B) Energy is constant throughout the fluid
 - C) Energy is constant along a stream line but may vary across
 - D) None of the above
81. What is the ratio of the velocity at the axis of the pipe to the mean velocity of flow in case of pipe flow under viscous conditions?
- A) 0.5
 - B) 0.67
 - C) 1
 - D) 2
82. Water hammer in a pipeline result from
- A) bursting of pipelines due to closure by a valve
 - B) a rapid pressure changes due to a rapid change in the rate of flow
 - C) a pressure increases due to closure of a valve resulting in decrease in rate of flow
 - D) none of the above
83. Which of the following is a first-order instrument?
- A) U-tube type mercury manometer
 - B) Bimetallic thermometer with covering
 - C) Vapour pressure thermometer without any covering
 - D) Mercury thermometer with covering
84. Which of the following is most suitable to measure a temperature of 2000°C?

- A) Ordinary mercury-in-glass thermometer
- B) Platinum resistance thermometer
- C) Radiation pyrometer
- D) Constant-volume hydrogen thermometer

85. In thermistors, the resistance

- A) Remains unaffected with change in temperature
- B) Increases with increase in temperature
- C) Increases linearly with increase in temperature
- D) Decreases with increase in temperature

86. In the Haber's process for the manufacture of ammonia

- A) Finely divided iron is used as a catalyst
- B) Finely divided molybdenum is used as a catalyst
- C) Finely divided nickel is used as a catalyst
- D) No catalyst is required

87. The polymer -A-A-B-B-AAA-B-B-represents

- A) block copolymer
- B) graft copolymer
- C) random copolymer
- D) alternate copolymer

88. Most widely and commonly used coagulant for the removal of suspended impurities in water is

- A) bleaching powder
- B) slaked lime
- C) alum
- D) copper sulphate

89. Contact process replaced Lead chamber process in the manufacture of sulphuric acid due to

- A) H_2SO_4 obtained by this method is pure and concentrated
- B) Acid of any strength can be prepared by this method
- C) Quite cheaper and easier to control
- D) All of these

90. Black liquor is converted into the white liquor by

- A) Evaporation and burning the concentrate followed by causticisation of products
- B) Multi-effect evaporation only
- C) Selective liquid extraction
- D) Extractive distillation

91. Unsaturated oils compared to saturated oils have

- A) Lower melting point and higher reactivity to oxygen
- B) Higher melting point and higher reactivity to oxygen
- C) Lower melting point and lower reactivity to oxygen
- D) Higher melting point and lower reactivity to oxygen

92. Polyethylene (PE) is

- A) an addition polymerization polymer
- B) a condensation polymerization polymer
- C) a thermosetting polymer
- D) very low molecular weight polymer

93. XLPE is the trade name of
- A) low density polyethylene
 - B) high density polyethylene
 - C) linear low density polyethylene
 - D) cross-linked polyethylene
94. True synthetic fibers are produced from polymers which are obtained by
- A) addition polymerization
 - B) condensation polymerization
 - C) either (A) or (B)
 - D) both (A) and (B)
95. For a specific impeller diameter, fixed impeller speed of a centrifugal pump and constant density
- A) NPSH required decreases with increase in the capacity
 - B) NPSH available increases with increase in the capacity
 - C) NPSH required increases with increase in the capacity
 - D) NPSH required and NPSH available both increase with increase in the capacity
96. The mechanical efficiency of a crushing machine is
- A) The ratio of the energy supplied to the machine to the surface energy created by crushing
 - B) The ratio of the surface energy created by crushing to the energy supplied to the machine
 - C) The ratio of the energy absorbed by the solid to the energy supplied to machine
 - D) The ratio of the surface energy created by crushing to the energy absorbed by the solid
97. Excessive use of chemical fertilisers causes shrivelling of the roots and wilting of the plant because the
- A) osmotic pressure of the soil water becomes less than that of the plant sap
 - B) soil becomes too alkaline
 - C) osmotic pressure of the soil water becomes higher than that of the plant sap
 - D) soil becomes too acidic
98. Baffles in the shell side of a shell and tube heat exchanger
- A) increase the cross-section of the shell side liquid
 - B) force the liquid to flow parallel to the bank
 - C) increase the shell side heat transfer coefficient
 - D) decrease the shell side heat transfer coefficient
99. In a shell and tube heat exchanger
- A) the temperature drops in the two fluids and the wall are proportional to individual resistances
 - B) the temperature drop is inversely proportional to the resistance across which the drop occurs
 - C) there is no relationship between temperature drop and resistance
 - D) the relationship is not generalised
100. LMTD for counter flow and parallel flow heat exchanger will be the same, when
- A) a cold fluid is heated to a certain temperature by condensing steam (isothermal fluid)
 - B) the outlet temperature of both the hot and cold fluid are same

- C) the outlet temperature of hot fluid is less than the outlet temperature of the cold fluid 2021
- D) none of these