

**Tribhuvan University**  
**Institute of Science and Technology**  
**4 Years B.Sc. Computer Science and Information Technology**  
**Entrance Examination**  
**Model Question**

**Full Marks: 100**

**Time: 2 hrs.**

**Attempt all question:**

**Mathematics**

(25 × 1 = 25)

1. If  $A = \{x | x^2 - 5x + 6 = 0\}$  &  $B = \{2, 4\}$ ,  $C = \{4, 5\}$  then  $A \times (B \cap C)$  is
  - a.  $\{(2, 4), (3, 4)\}$
  - b.  $\{(4, 2), (4, 3)\}$
  - c.  $\{4\}$
  - d. empty set
2. The range of  $y = \sqrt{4 - x^2}$  is
  - a.  $[-2, 2]$
  - b.  $[-2, 0]$
  - c.  $[0, 2]$
  - d.  $(-\infty, \infty)$
3. The polar co-ordinates of the point  $x = -\sqrt{3}$  &  $y = 1$  are
  - a.  $r = 1, \theta = 30^\circ$
  - b.  $r = 2, \theta = 150^\circ$
  - c.  $r = 1, \theta = 150^\circ$
  - d.  $r = 2, \theta = 30^\circ$

4. If  $\alpha = -3, \beta = 2$  be two roots of an equation  $ax^2 + bx + c = 0$ . Then the equation is
- $x^2 + x + 6 = 0$
  - $x^2 + x - 6 = 0$
  - $x^2 - x - 6 = 0$
  - $x^2 - x + 6 = 0$
5. The stationary point for the curve  $f(x) = x^2 - 2x$  is
- $(1, -1)$
  - $(1, 1)$
  - $(-1, 0)$
  - $(0, 2)$
6. The sum of three cube roots of unity is
- 0
  - 1
  - $i$
  - $-i$
7.  $\frac{d}{dx}(\cot x)$  equals
- $\operatorname{cosec}^2 x$
  - $\cot x \operatorname{cosec} x$
  - $-\cot x \operatorname{cosec} x$
  - $-\operatorname{cosec}^2 x$
8. The value of  $\int_0^2 \frac{xdx}{\sqrt{x^2+4}}$  is
- $2\sqrt{2}$
  - 2
  - $2\sqrt{2} - 2$
  - $2\sqrt{2} + 2$

9. The value of  $\int_1^2 \frac{\sin(\log t)}{t} dt$  is
- $1 - \cos(\log 2)$
  - $\cos \log 2$
  - $\log 2$
  - 1
10. The value of the integral  $\int \log x dx$  is
- $x \log x + c$
  - $x + c$
  - $x \log x - x + c$
  - $\log x + c$
11. If  $f, g: R \rightarrow R$  defined by  $f(x) = x^2 + 1, f(x) = x^5$ , then  $(f \circ g)(x)$  is
- $(x^2 + 1)^5$
  - $x^{10} + 1$
  - $(x^{10} + 1)^5$
  - $x^5 + x^2 + 1$
12. If  $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ , then  $A^{-1}$  is
- $-\frac{1}{19}A$
  - $A$
  - $-A$
  - $\frac{1}{19}A$
13. The area bounded by the x-axis, the ordinates and the curve  $y = x^2, x = 1, x = 2$  is
- 7
  - $\frac{7}{3}$
  - $\frac{8}{3}$
  - $\frac{1}{3}$

14. The value of  $\frac{2(\cos 70^\circ + i \sin 70^\circ)}{\cos 10^\circ + i \sin 10^\circ}$  is

- a.  $1 - i\sqrt{3}$
- b.  $1 + i\sqrt{3}$
- c.  $i\sqrt{3}$
- d. 1

15. If  $\cos^{-1} x + \cos^{-1} y = \frac{\pi}{2}$  then

- a.  $x^2 + y^2 = 1$
- b.  $x^2 + y^2 = -1$
- c.  $x^2 - y^2 = 1$
- d.  $x^2 + y^2 = 0$

16. If  $\omega$  be a complete cube root of unity, then  $(1 + \omega - \omega^2)^3$  equals

- a. 1
- b.  $\omega$
- c. 0
- d. -8

17. The value of  $\tan^{-1} 2 + \cot^{-1} 2$  is

- a. 0
- b. 1
- c.  $\frac{\pi}{2}$
- d.  $\pi$

18.  $\lim_{x \rightarrow 0} \frac{1 - \cos 3x}{3x^2}$  equals

- a.  $\frac{2}{3}$
- b.  $\frac{1}{3}$
- c.  $\frac{3}{2}$
- d. 0

19. The sum of  $n$  terms of the series  $a + ar + ar^2 + ar^3 + \dots$  is

- a.  $ar^{n-1}$
- b.  $\frac{a(r^n - 1)}{r - 1}$
- c.  $\frac{ar^n - 1}{r - 1}$
- d.  $\frac{ar^{n-1} - 1}{r - 1}$

20. If  $x = t + \frac{1}{t}$  &  $y = t - \frac{1}{t}$  then  $\frac{dy}{dx}$  is

- a.  $\frac{t^2-1}{t^2+1}$
- b.  $\frac{t^2+1}{t^2-1}$
- c.  $t^2 + 1$
- d.  $t^2 - 1$

21. The angle between the line pair  $2x^2 + 7xy + 3y^2 = 0$  is

- a.  $45^\circ$
- b.  $135^\circ$
- c.  $45^\circ$  or  $135^\circ$
- d.  $30^\circ$

22. Equation of a circle with radius 1 and Centre (1, 2) is

- a.  $x^2 + y^2 - 2x - 4y + 4 = 0$
- b.  $x^2 + y^2 - 2x + 4 = 0$
- c.  $x^2 + y^2 = 0$
- d.  $x^2 + y^2 + 2x + 4y + 4 = 0$

23. If  $A$  is a square matrix, then the matrix  $A - A^T$  is

- a. Symmetric
- b. 0
- c. Skew-symmetric
- d. Identity

24. If two linear equations in two variables represent parallel lines, then the equations are

- a. Consistent and dependent
- b. Consistent and independent
- c. Inconsistent and independent
- d. None

25. If  $f(x) = \begin{cases} 2x + 3 & \text{for } x < 1 \\ 4 & \text{for } x = 1 \\ 6x - 1 & \text{for } x > 1 \end{cases}$  then the function is

- a. Discontinuous at  $x = 1$
- b. Continuous at  $x = 1$
- c. The limit does not exist
- d. Continuous at  $x = 0$

## Physics

(25 × 1 = 25)

26. The viscous force ( $\vec{F}$ ) acting between liquid layers of area  $A$  and velocity gradient  $\left(\frac{d\vec{v}}{dx}\right)$  is given by,  $\vec{F} = -\eta A \frac{d\vec{v}}{dx}$  where  $\eta$  is a constant called coefficient of viscosity. The dimensions of  $\eta$  are:

- a.  $ML^{-1}T^{-2}$
- b.  $MLT^{-2}$
- c.  $ML^{-1}T^{-1}$
- d.  $ML^{-2}T^{-2}$

27. The maximum value of magnitude ( $\vec{A} - \vec{B}$ ) is

- a.  $A + B$
- b.  $A - B$
- c.  $A$
- d.  $B$

28. In the normal reaction is doubled, the force of limiting friction becomes;

- a. Half
- b. Double
- c. Four times
- d. One fourth

29. A rocket is launched with a speed less than escape speed from earth. The sum of its kinetic and potential energy is

- a. Positive
- b. Negative
- c. Zero
- d. May be positive or negative depending upon its initial speed

30. After terminal velocity is reached the acceleration of a body falling through a fluid is

- a. Equal to  $g$
- b. Less than  $g$
- c. Greater than  $g$
- d. Zero

31. At what temperature do the Celsius and Fahrenheit scales coincide?
- $-40^{\circ}$
  - $-32^{\circ}$
  - $0^{\circ}$
  - $-45^{\circ}$
32. In an ideal gas the molecules possess
- Only potential
  - Only kinetic energy
  - Kinetic and potential energy both
  - Only gravitational energy
33. In an adiabatic expansion temperature of the system
- Remains constant
  - Increases
  - Decreases
  - May increase or decrease
34. A steam engine operates between  $300K$  and  $600K$ , the maximum possible efficiency of this engine is
- 100%
  - 75%
  - 50%
  - 25%
35. The field of view is maximum for
- Cylindrical mirror
  - Plane mirror
  - Concave mirror
  - Convex mirror
36. Total internal reflection of light is possible when light enters from
- Air to glass
  - Water to air
  - Air to water
  - Vacuum to air
37. A prism has angle of prism  $A$  and critical angle  $C$ . The condition for totally reflecting prism is
- $A = 2C$
  - $A < 2C$
  - $A \leq 2C$
  - $A > 2C$

38. When a convex lens of flint glass is immersed in water, its focal length
- Increases
  - Decreases
  - Remains unchanged
  - May increase or decrease depending upon material of lens
39. Which of the following is the most important factor that helps to recognize a person by his voice alone?
- Loudness
  - Pitch
  - Intensity
  - Quality
40. Velocity of sound is maximum in
- Oxygen
  - Hydrogen
  - Nitrogen
  - Ammonia
41. Two waves having a phase difference of  $60^\circ$  have a path difference of
- $2\lambda$
  - $\frac{\lambda}{3}$
  - $\frac{\lambda}{6}$
  - $\frac{\lambda}{2}$
42. A capacitor of capacitance  $2 \mu F$  is charged to  $500V$ , what is the energy stored?
- 0.25 J
  - 0.5 J
  - 0.2 J
  - 2 J
- 43.
- Energy
  - Charge
  - Mass
  - Momentum



44.

- a. Attract each other
- b. Cancel each other
- c. Repel each other
- d. Neither attract nor repel

45.

- a. Weber
- b. Weber/ $m^3$
- c. Gauss
- d. Tesla

46. In Nepal, the voltage of domestic AC supply is 220V. What does this represent?

- a. Root mean voltage
- b. Root mean squared voltage
- c. Mean voltage
- d. Peak voltage

47. The size of an atom is nearly equal to

- a. One millimeter
- b. One Pico meter
- c. One Angstrom
- d. One micron

48. The specific charge of an electron is;

- a.  $1.75 \times 10^{11} \text{ C/Kg}$
- b.  $1.2 \times 10^9 \text{ C/Kg}$
- c.  $1.6 \times 10^{-19} \text{ C/Kg}$
- d.  $9.31 \times 10^{-31} \text{ C/Kg}$

49. The half-life of radium is 1600 years. What is its mean life?

- a. 800 years
- b. 1600 years
- c. 4618 years
- d. 2309 years

50. An example of n-type semiconductor is

- a. Pure Si
- b. Si doped with phosphorus
- c. Pure Ge
- d. Ge doped with boron

## Chemistry

(25 × 1 = 25)

51. The alkenes may be represented by a general formula:

- a.  $C_nH_{2n+2}$
- b.  $C_nH_{2n}$
- c.  $C_nH_{2n-2}$
- d.  $C_nH_{2n+1}$

52. When alkyl halides are heated with sodium metal in ether, two molecules of the alkyl halide combine to give:

- a. Alkene
- b. Alkyne
- c. Alkane
- d. Alcohol

53. The compound  $Fe_4[Fe(CN)_6]_3$  is known as:

- a. Prussian blue
- b. Tollen's reagent
- c. Baeyer's reagent
- d. None of the above

54. The product of the reaction:  $CH_2 + CH_2 + 4O \xrightarrow{H^+}$  is

- a.  $CH_3CH_2OH$
- b.  $2HCOOH$
- c.  $CH_3COOH$
- d.  $H_2C_2O_4$

55. What is the possible product of the following reaction?  $C_6H_5OH + NH_3 \xrightarrow{ZnCl_2}$

- a. Nitrobenzene
- b. Aniline
- c. Benzene
- d. Acetanilide

56. Which of the following reagents is used to detect the aldehyde group?

- a. *aq.*  $CuSO_4$
- b. Ninhydrin reagent
- c. Nessler's reagent
- d. Tollen's reagent

57. What product will be formed when ethylene is passed in cold and alkaline  $KMnO_4$  solution?
- Aniline
  - Acetylene
  - Ethylene glycol
  - None of the above
58. When benzene and hydrogen are passed over finely divided nickel heated to  $150 - 200^\circ C$ , the product formed is:
- Benzoic acid
  - Cyclohexane
  - Benzamide
  - Nitrobenzene
59. Permanent hardness of water may be caused by:
- Calcium chloride
  - Magnesium chloride
  - Calcium sulphate and magnesium sulphate
  - All of the above
60. The formula of Calgon is:
- $Na_2[Na_4(PO_3)_6]$
  - $Na_2[Mg_2(PO_3)_6]$
  - $Mg(HCO_3)_2$
  - $Ca(HCO_3)_2$
61. Calamine is an ore of the metal:
- Iron
  - Cadmium
  - Zinc
  - Magnesium
62.  $N_2O$  is a:
- Basic oxide
  - Acidic oxide
  - Neutral oxide
  - Amphoteric oxide
63. Amongst the following elements the one having highest ionization energy is
- Sodium
  - Boron
  - Carbon
  - Neon

64. Mercuric chloride is also known as:
- Blue vitriol
  - Malachite
  - Calomel
  - Corrosive sublimate
65. Nitric oxide is formed, when copper reacts with:
- conc. HNO<sub>3</sub>*
  - dil. HNO<sub>3</sub>*
  - dil. HCl*
  - dil. H<sub>2</sub>SO<sub>4</sub>*
66. The general electronic configuration of coinage metals is:
- $ns^1$
  - $ns^2$
  - $(n - 1)d^{10} ns^1$
  - $ns^2np^5$
67. How many moles of atoms are contained in 15g of Zn?
- 0.272 moles
  - 2 moles
  - 0.229 moles
  - 0.5 moles
68. What is the normality of a 2% NaOH solution?
- 3 N
  - 0.25 N
  - 0.5 N
  - 1 N
69. Potassium permanganate is a:
- Strong reducing agent
  - Strong oxidizing agent
  - Weak reducing agent
  - Weak oxidizing agent
70. Equivalent weight of H<sub>2</sub>SO<sub>4</sub> is equal to:
- Its molecular weight
  - Molecular weight / 2
  - Molecular weight / 3
  - Molecular weight / 4

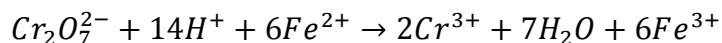
71. What volume of 0.5N  $NaOH$  is required to neutralize 50ml of 1.5N  $HCl$ ?

- a. 120 ml
- b. 100 ml
- c. 150 ml
- d. 50 ml

72. How many grams of calcium are present in 4.25g- atoms of calcium?

- a. 160g
- b. 100g
- c. 170g
- d. 120g

73. In the given reaction which element is reduced?



- a. Iron
- b. Chromium
- c. Hydrogen
- d. Oxygen

74. The rate of a reaction generally increases with

- a. Decrease in temperature
- b. Decrease in concentration
- c. Increase in temperature
- d. None of above

75. The number of electrons in  $d$  orbitals of an atom having atomic number 29 at ground state is

- a. 1
- b. 5
- c. 10
- d. 0

## English

(25 × 1 = 25)

I. Fill in the blanks with best choice in the following sentences:

76. My children ..... that movie

- a. Were disappointed by
- b. Were disappointed of
- c. Disappointing
- d. Were disappointing in

77. The fact ..... Gopal can sing well has made him popular among his friends

- a. Of
- b. That
- c. Is that
- d. Which is

78. .... he was ill, he went to school

- a. Despite
- b. In spite of
- c. Although
- d. None the less

79. Refrigerating means ..... the spread of bacteria

- a. Retards
- b. Retarding
- c. To retard
- d. Is retarded

80. Either he or ..... were to be blamed

- a. That boy
- b. The boys
- c. His brother
- d. That girl

II. Complete the following analogies or comparisons:

81. Ear is to leg as corn is to .....

- a. Table
- b. Celery
- c. Lamb
- d. Road

82. Body is to helmet as finger is to .....

- a. Thimble
- b. Glove
- c. Bandage
- d. Nail

III. Select the appropriate preposition from the choices given below:

83. The answers to the problems are ..... page 200

- a. At
- b. In
- c. On
- d. To

84. I asked him ..... the homework I missed when I was absent

- a. About
- b. For
- c. Of
- d. No preposition

85. Both of them have lived here ..... twenty years

- a. For
- b. During
- c. Since
- d. While

IV. Choose the best answer

86. The man ..... us how to use the new photocopier

- a. Said
- b. Told
- c. Repeated
- d. Explained

87. We held a meeting to ..... what to do

- a. Say
- b. Repeat
- c. Tell
- d. Discuss

88. Nobody likes you, .....

- a. Doesn't he
- b. Don't they
- c. Does it
- d. Do they

89. When Carol called me last night, I ..... television

- a. Has been watched
- b. Watching
- c. Has been watching
- d. Was watching

90. Neither Gita nor Sita ..... in this school

- a. Are reading
- b. Reads
- c. Have been reading
- d. Were reading

91. Some of the grain ..... to be contaminated

- a. Appear
- b. Appears
- c. Appearing
- d. Is appearing

92. A high percentage of the population ..... voting for the new school

- a. Is
- b. Are
- c. Have been
- d. Were

V. Select the word which is closest to the opposite meaning to the following words:

93. Quiet

- a. Put down
- b. Relent
- c. Refrain
- d. Incite

94. Provincial

- a. Affluent
- b. Sophisticated
- c. Marrow minded
- d. Contentions



95. Puerile

- a. Adult
- b. Childish
- c. Fertile
- d. Frantic

96. Thrifty

- a. Reckless
- b. Invalid
- c. Impious
- d. Austere

97. Come here .....

- a. Shall you
- b. Will you
- c. Do you
- d. Don't you

98. I ..... for this company for more than twenty years, and I intend to stay here until I retire

- a. Had worked
- b. Had been working
- c. Have been working
- d. Worked

99. Three quarter of the students ..... against the tuition hike.

- a. Is
- b. Are
- c. Was
- d. Has been

100. Potent

- a. Vigorous
- b. Robust
- c. Fervent
- d. Weak