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

$(25 \times 1 = 25)$

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. $r = 1, \theta = 30^0$

   b. $r = 2, \theta = 150^0$

   c. $r = 1, \theta = 150^0$

   d. $r = 2, \theta = 30^0$

4. If $\alpha = -3, \beta = 2$ be two roots of an equation $ax^2 + bx + c = 0$. Then the equation is

a. $x^2 + x + 6 = 0$

b. $x^2 + x - 6 = 0$

c. $x^2 - x - 6 = 0$

d. $x^2 - x + 6 = 0$

5. The stationary point for the curve $f(x) = x^2 - 2x$ is

a. $(1, -1)$

b. $(1, 1)$

c. $(-1, 0)$

d. $(0, 2)$

6. The sum of three cube roots of unity is

a. 0

b. 1

c. i

d. $-i$

7. $\frac{d}{dx}(\cot x)$ equals

a. $cosec^2 x$

b. $\cot x \ cosec\ x$

c. $-\cot x \ cosec\ x$

d. $-cosec^2 x$

8. The value of $\int_0^2 \frac{xdx}{\sqrt{x^2+4}}$ is

a. $2\sqrt{2}$

b. 2

c. $2\sqrt{2} - 2$

d. $2\sqrt{2} + 2$

9. The value of $\int_1^2 \frac{\sin(\log t)}{t} dt$ is

a. $1 - \cos(\log 2)$

b. $\cos \log 2$

c. $\log 2$

d. 1

10. The value of the integral $\int \log x \, dx$ is

a. $x \log x + c$

b. $x + c$

c. $x \log x - x + c$

d. $\log x + c$

11. If $f.g: R \to R$ defined by $f(x) = x^2 + 1, f(x) = x^5$, then $(f_0 g)(x)$ is

a. $(x^2 + 1)^5$
b. $x^{10} + 1$
c. $(x^{10} + 1)^5$
d. $x^5 + x^2 + 1$

12. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, then A^{-1} is

a. $-\frac{1}{19}A$
b. A
c. $-A$
d. $\frac{1}{19}A$

13. The area bounded by the x-axis, the ordinates and the curve $y = x^2, x = 1, x = 2$ is

a. 7
b. $\frac{7}{3}$
c. $\frac{8}{3}$
d. $\frac{1}{3}$

14. The value of $\frac{2(\cos 70^0+i\sin 70^0)}{\cos 10^0+i\sin 10^0}$ 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 ω be a complete cube root of unity, then $(1+\omega-\omega^2)^3$ equals

a. 1
b. ω
c. 0
d. -8

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

a. 0
b. 1
c. $\frac{\pi}{2}$
d. π

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

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

19. The sum of n terms of the series $a+ar+ar^2+ar^3+\cdots$ 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. 45^0
b. 135^0
c. 45^0 *or* 135^0
d. 30^0

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 $f(x) = \begin{Bmatrix} 2x+3 & for & x<1 \\ 4 & for & x=1 \\ 6x-1 & for & x>1 \end{Bmatrix}$ 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

$(25 \times 1 = 25)$

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, $\vec{F} = -\eta \wedge \frac{d\vec{v}}{dx}$ where η is a constant called coefficient of viscosity. The dimensions of η 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?

a. -40^0
b. -32^0
c. 0^0
d. -45^0

32. In an ideal gas the molecules possess

a. Only potential
b. Only kinetic energy
c. Kinetic and potential energy both
d. Only gravitational energy

33. In an adiabatic expansion temperature of the system

a. Remains constant
b. Increases
c. Decreases
d. May increase or decrease

34. A steam engine operates between $300K$ and $600K$, the maximum possible efficiency of this engine is

a. 100%
b. 75%
c. 50%
d. 25%

35. The field of view is maximum for

a. Cylindrical mirror
b. Plane mirror
c. Concave mirror
d. Convex mirror

36. Total internal reflection of light is possible when light enters from

a. Air to glass
b. Water to air
c. Air to water
d. Vacuum to air

37. A prism has angle of prism A and critical angle C. The condition for totally reflecting prism is

a. $A = 2C$
b. $A < 2C$
c. $A \leq 2C$
d. $A > 2C$

38. When a convex lens of flint glass is immersed in water, its focal length

a. Increases
b. Decreases
c. Remains unchanged
d. 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?

a. Loudness
b. Pitch
c. Intensity
d. Quality

40. Velocity of sound is maximum in

a. Oxygen
b. Hydrogen
c. Nitrogen
d. Ammonia

41. Two waves having a phase difference of 60^0 have a path difference of

a. 2λ
b. $\frac{\lambda}{3}$
c. $\frac{\lambda}{6}$
d. $\frac{\lambda}{2}$

42. A capacitor of capacitance 2 μF is charged to $500V$, what is the energy stored?

a. 0.25 J
b. 0.5 J
c. 0.2 J
d. 2 J

43. Kirchoff's voltage law is based on the principle of Conservation of

a. Energy
b. Charge
c. Mass
d. Momentum

44. Two parallel wires carrying currents in opposite directions:
    a. Attract each other
    b. Cancel each other
    c. Repel each other
    d. Neither attract nor repel

45. In SI system, the unit of magnetic field is
    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. $1.75 \times 10^{11}\ C/Kg$
    b. $1.2 \times 10^{9}\ C/Kg$
    c. $1.6 \times 10^{-19}\ C/Kg$
    d. $9.31 \times 10^{-31}\ C/Kg$

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

$(25 \times 1 = 25)$

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: $CH_2 + CH_2 + 40 \xrightarrow{H^+}$ 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?

a. Aniline
b. Acetylene
c. Ethylene glycol
d. None of the above

58. When benzene and hydrogen are passed over finely divided nickel heated to $150 - 200^0\ C$, the product formed is:

a. Benzoic acid
b. Cyclohexane
c. Benzamide
d. Nitrobenzene

59. Permanent hardness of water may be caused by:

a. Calcium chloride
b. Magnesium chloride
c. Calcium sulphate and magnesium sulphate
d. All of the above

60. The formula of Calgon is:

a. $Na_2[Na_4(PO_3)_6]$
b. $Na_2[Mg_2(PO_3)_6]$
c. $Mg(HCO_3)_2$
d. $Ca(HCO_3)_2$

61. Calamine is an ore of the metal:

a. Iron
b. Cadmium
c. Zinc
d. Magnesium

62. N_20 is a:

a. Basic oxide
b. Acidic oxide
c. Neutral oxide
d. Amphoteric oxide

63. Amongst the following elements the one having highest ionization energy is

a. Sodium
b. Boron
c. Carbon
d. Neon

64. Mercuric chloride is also known as:

a. Blue vitriol
b. Malachite
c. Calomel
d. Corrosive sublimate

65. Nitric oxide is formed, when copper reacts with:

a. $conc. HNO_3$
b. $dil. HNO_3$
c. $dil. HCl$
d. $dil. H_2SO_4$

66. The general electronic configuration of coinage metals is:

a. ns^1
b. ns^2
c. $(n-1)d^{10}\ ns^1$
d. ns^2np^5

67. How many moles of atoms are contained in $15g$ of Zn?

a. 0.272 moles
b. 2 moles
c. 0.229 moles
d. 0.5 moles

68. What is the normality of a 2% $NaOH$ solution?

a. 3 N
b. 0.25 N
c. 0.5 N
d. 1 N

69. Potassium permanganate is a:

a. Strong reducing agent
b. Strong oxidizing agent
c. Weak reducing agent
d. Weak oxidizing agent

70. Equivalent weight of H_2SO_4 is equal to:

a. Its molecular weight
b. Molecular weight / 2
c. Molecular weight / 3
d. 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?

$$Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow 2Cr^{3+} + 7H_2O + 6Fe^{3+}$$

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

$(25 \times 1 = 25)$

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