

RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE, RAHARA, KOLKATA
Undergraduate Admission Test 2022: Computer Science Honours

Full Marks : 150

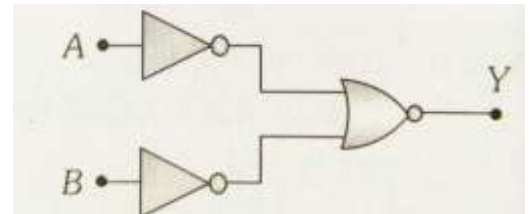
Time : 2hours

- 1) On which conservation law, does a rocket work?
 - a) Mass
 - b) Energy
 - c) Linear momentum
 - d) Angular momentum
- 2) In a semiconductor, the concentration of electrons is $8 \times 10^{14} / \text{cm}^3$ and that of holes is $5 \times 10^{12} / \text{cm}^3$. The semiconductor is:
 - a) P-type
 - b) N-type
 - c) Intrinsic
 - d) PNP-type
- 3) Which of the following is a dimensionless quantity?
 - a) Strain
 - b) Specific heat
 - c) Quantity of heat
 - d) Stress
- 4) $(61)_{10} = (\text{_____})_2$
 - a) 101101
 - b) 111111
 - c) 100111
 - d) 111101
- 5) Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is:
 - a) 0.75 A
 - b) Zero
 - c) 0.25 A
 - d) 0.5 A



- 6) Two spheres carrying charges $+6 \mu\text{C}$ and $+9 \mu\text{C}$, separated by a distance d , experiences a force of repulsion F . When a charge of $-3 \mu\text{C}$ is given to both the sphere and kept at the same distance as before, the new force of repulsion is:
 - a) $3F$
 - b) $F/9$
 - c) F
 - d) $F/3$
- 7) The position x of a particle varies with time as $x = at^2 - bt^3$. The acceleration of the particle is zero at time t which will be equal to:
 - a) $\frac{2a}{3b}$
 - b) $\frac{b}{a}$
 - c) $\frac{a}{3b}$
 - d) Zero

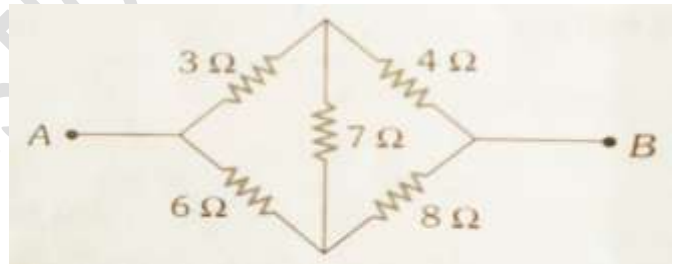
- 8) A light bulb is placed between two plane mirrors inclined at an angle of 60° . The number of images formed is:
- 6
 - 2
 - 5
 - 4
- 9) The output of OR gate is 1 if
- Both inputs are zero
 - Either or both inputs are 1
 - Only both inputs are 1
 - Either input is zero
- 10) Two masses M and $M/2$ are joined together by means of light inextensible string passed over a frictionless pulley. When the bigger mass is released, the smaller one will ascend with an acceleration of:
- $g/3$
 - $3g/2$
 - g
 - $g/2$
- 11) At a given temperature, velocity of sound in oxygen and in hydrogen has the ratio:
- 4:1
 - 1:4
 - 1:1
 - 2:1
- 12) Which logic gate is represented by the given combination of logic gates?
- OR
 - NAND
 - AND
 - NOR



- 13) The position of centre of mass of a system of particles does not depend upon:
- Masses of particles
 - Forces on particles
 - Position of the particles
 - Relative distance between the particles
- 14) The current flowing through a wire depends on time as $I = 3t^2 + 2t + 5$. The charge flowing through the cross-section of the wire in time from $t=0$ to $t=2$ sec is
- 22 C
 - 20 C
 - 18 C
 - 5 C

- 15) A person uses spectacles of power +2D. He is suffering from
- Short sightedness or myopia
 - Long sightedness or hypermetropia
 - Presbyopia
 - Astigmatism

- 16) If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will
- increase
 - decrease
 - remain the same
 - first increase and then decrease
- 17) A Carnot's engine operates with source at 127°C and sink at 27°C . If the source supplies 40 kJ of heat energy, the work done by the engine is
- 30 kJ
 - 10 kJ
 - 4 kJ
 - 1 kJ
- 18) The half-life of Bi^{210} is 5 days. What time is taken by $(7/8)$ th part of the sample to decay?
- 3.4 days
 - 10 days
 - 15 days
 - 20 days
- 19) If the frequency of human heart beat is 1.25 Hz, the number of heart beats in 1 minutes is
- 80
 - 65
 - 90
 - 75
- 20) In the given figure, equivalent resistance between A and B will be:
- $\frac{14}{3} \Omega$
 - $\frac{3}{14} \Omega$
 - $\frac{14}{9} \Omega$
 - $\frac{9}{14} \Omega$



- 21) The number of surjections from $A = \{1,2,3, \dots, 2022\}$ onto $B = \{a, b\}$ is
- 2^{2022}
 - $2^{2022} - 1$
 - $2^{2022} - 2$
 - None of these
- 22) If $f(x) = \log(\cos x)$, then the value of $f''(x)$ is
- $\sec^2 x$
 - $-\sec^2 x$
 - $\operatorname{cosec}^2 x$
 - $-\operatorname{cosec}^2 x$

23) The sum of infinite series $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \infty$ is

- a) $\frac{1}{3}$
- b) 3
- c) $\frac{1}{4}$
- d) ∞

24) If $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $10 \cdot A^{-1} = \begin{pmatrix} 4 & 2 & 2 \\ \alpha & 0 & 5 \\ 1 & -2 & 3 \end{pmatrix}$ Then the value of α is

- a) 2
- b) -5
- c) -2
- d) 5

25) The remainder term when divide -27 by 6 is

- a) -3
- b) 3
- c) Undetermined
- d) Undefined

26) The first two terms of an H.P. are $\frac{2}{5}$ and $\frac{12}{23}$. The value of the largest term of the H.P. is

- a) $\frac{72}{73}$
- b) 6
- c) $\frac{1}{6}$
- d) None of the above.

27) If

$S = \{1,2,3,4\}$ and $f, g : S \rightarrow S$ are defined by $f = \{(1,3), (2,2), (3,4), (4,1)\}$ and

$g = \{(1,4), (2,3), (3,1), (4,2)\}$ then $g^{-1} \circ f \circ g =$

- a) $\{(1,3), (2,2), (3,4), (4,1)\}$
- b) $\{(1,3), (2,2), (4,3), (4,4)\}$
- c) $\{(1,3), (2,1), (2,3), (4,4)\}$
- d) $\{(1,3), (2,1), (3,2), (4,4)\}$

- 28) 99^{th} term of the series $2 + 7 + 14 + 23 + 34 + \dots$ is
- 9999
 - 9998
 - 10000
 - None of these
- 29) Let $A = \{x: x \text{ is a digit in the number } 3519\}$, and $B = \{x: x \in \mathbb{N}, x < 10\}$. Then which of the following is false?
- $A \cap B = \{1, 3, 5, 9\}$
 - $A - B = \phi$
 - $B - A = \{2, 4, 6, 7, 8\}$
 - $A \cup B = \{1, 2, 3, 5, 9\}$
- 30) If $f(x) = \frac{x-1}{x+1}$, then $f(2x)$ is equal to:
- $\frac{3f(x)+1}{f(x)+3}$
 - $\frac{f(x)+1}{f(x)+3}$
 - $\frac{f(x)+3}{f(x)+1}$
 - none of these
- 31) Which one of the following is not a function?
- $\{(x, y): x, y \in \mathbb{R}, x^2 = y\}$
 - $\{(x, y): x, y \in \mathbb{R}, y^2 = x\}$
 - $\{(x, y): x, y \in \mathbb{R}, x^3 = y\}$
 - $\{(x, y): x, y \in \mathbb{R}, y^3 = x\}$
- 32) Which of the following function is periodic?
- $[x] - x$
 - $\cos \frac{1}{x}$
 - $x \sin x$
 - $[x] + x$
- 33) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ such that $f(x) = \frac{1}{1+x^2}$, $x \in \mathbb{R}$. Then f is
- injective
 - surjective
 - bijective
 - none of these
- 34) In a class of 47 students, 23 can speak Bengali only and 11 can speak English only. The number of students, who can speak both Bengali and English is
- 12
 - 13
 - 24
 - 17
- 35) What will be the remainder when $1! + 2! + 3! + \dots + 75!$ is divided by 15?
- 4
 - 3
 - 0
 - 5

36) For what value of λ the system of equations

$$\begin{aligned}6x + 5y + \lambda z &= 0, \\3x - y + 4z &= 0, \\x + 2y - 3z &= 0,\end{aligned}$$

has a non-trivial solution?

- a) $\lambda = 0$
- b) $\lambda = -5$
- c) $\lambda = 5$
- d) none of these

37) Two dice are rolled one after another. The probability that the number on the first is less than or equal to the number on the second is

- a) $5/18$
- b) $7/18$
- c) $5/12$
- d) $7/12$

38) Let $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{i} + 6\hat{j} + \lambda\hat{k}$ be two vectors, they will be parallel if

- a) $\lambda = 3$
- b) $\lambda = 2$
- c) $\lambda = -3$
- d) $\lambda = -2$

39) The solution of the differential equation $f(x)\frac{dy}{dx} + f'(x)y = 1$ is

- a) $y = xf(x) + c$
- b) $x = yf(x) + c$
- c) $xy = f(x) + c$
- d) none of these

40) If two vectors \vec{a} and \vec{b} be such that $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then they are

- a) parallel
- b) perpendicular
- c) equal
- d) none of these

41) If A be a 3×3 matrix with $|A| = 4$, then the value of $|2A|$ will be

- a) 8
- b) 16
- c) 24
- d) 32

42) Two lines $\frac{x-1}{2} = \frac{y+1}{1} = \frac{z-2}{\mu}$ and $\frac{1-x}{1} = \frac{y-2}{\mu} = \frac{z+1}{1}$ will be mutually perpendicular if the value of μ is

- a) 1
- b) -1
- c) 0
- d) 2

- 43) The integrating factor of the differential equation $x \frac{dy}{dx} + 2y = x^2$ is
- e^{2x}
 - $2x$
 - e^{x^2}
 - x^2
- 44) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 2x + \sin x$ for $x \in \mathbb{R}$. Then f is
- One-one and onto
 - One-one but not onto
 - Onto but not one-one
 - Either one-one nor onto
- 45) The area of the region bounded by the curve $y = x^2$ and $x = y^2$ is
- $\frac{1}{2}$
 - $\frac{1}{3}$
 - $\frac{1}{4}$
 - None of these
- 46) $2^{\sqrt{2}}$ is equal to
- A rational number.
 - An irrational number.
 - A transcendental number.
 - None of these.
- 47) If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and $A \text{ adj } A = AA^T$, then $5a + b$ is equal to
- 13
 - 5
 - 4
 - 1
- 48) The maximum value of $\sin x + \cos x$ is
- 2
 - 1
 - $\sqrt{2}$
 - $1 + \sqrt{2}$
- 49) If the coefficient of x^3 in $\left(x^2 + \frac{k}{x}\right)^6$ is 160, then the value of k is
- 3
 - 4
 - 2
 - 2
- 50) Probability that a leap year selected at random contains either 53 Tuesday or Wednesday is
- $\frac{2}{7}$
 - $\frac{3}{7}$
 - $\frac{1}{7}$
 - $\frac{4}{7}$