



Ramakrishna Mission Vivekananda Educational and Research Institute

Deemed-to-be-University as declared by Government of India under section 3 of UGC Act, 1956

Admission Test For MSc in Data Science and Artificial Intelligence

Model Question Paper

Instructions:

Mark your answers only on the provided printed answer sheet

Correct answer: **4** marks

Incorrect answer: **-1** mark

Unanswered question: **0** mark

Applicant's Name (in block letters):

Max Marks:140

Application No:

Time: 2 hrs

Part A - Common

- The distance of the point $(1, -2, 3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is
a. $1/7$ b. 1 c. $5/7$ d. 7 e. $7/5$
- $\lim_{\lambda \rightarrow 0} \frac{x^\lambda - 1}{\lambda}$ is equal to
a. 1 b. ∞ c. 0 d. $\ln(x)$ e. x
- Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function satisfying $f(x) + f(3 - x) = 2$. What is $\int_0^3 f(x) dx$?
a. 4 b. 6 c. 1 d. 2 e. 3
- What is $\int_1^2 \frac{1}{t} \ln(t) dt$?
a. $\frac{1}{2}(\ln(2))^2$ b. $\ln(4)$ c. $\ln(2)$ d. 1 e. $\frac{1}{2} \ln(4)$
- Let $\int_1^8 f(x) dx = 12$, $\int_5^1 f(x) dx = 3$, $\int_7^8 f(x) dx = 4$. What is $\int_5^7 (2f(x) - 1) dx$?
a. 11 b. 20 c. 15 d. 22 e. 17
- The side of square is increasing at a rate of 3 inches per minute. Find the rate of change of the area of the square, in square inches per second, when the side length is 2 inches.
a. 12 b. 6 c. $\frac{3}{2}$ d. 18 e. $\frac{1}{5}$
- Which of the following is *not* a continuous function for all x ?
a. $f(x) = |x|$ b. $f(x) = mx - b$ c. $f(x) = \frac{x^2+1}{x+2}$ d. $f(x) = 1055$ e. $f(x) = (x+3)^4$
- What are the number of discontinuities of $f(x) = \frac{x}{[x]}$, $1 \leq x \leq 5$, where $[x]$ is the largest integer $\leq x$?
a. 2 b. 1 c. 0 d. 3 e. 4
- Let f be a strictly increasing and continuous function in $[a, b]$. Which of the following is correct about f^{-1} in $[f(a), f(b)]$?
a. f^{-1} does not exist b. f^{-1} is constant c. f^{-1} is neither decreasing nor increasing d. f^{-1} is strictly decreasing e. f^{-1} is strictly increasing and continuous
- Let $f(x) = x^3 - 3x^2 + x - 1$. What is an equation of a tangent to f at $x = 3$?
a. $y = -10x + 28$ b. $y = 28x + 10$ c. $y = -10x - 28$ d. $2y = 10x + 28$ e. $y = 10x - 28$
- What is the number of points where $(\sqrt{3} \cos \theta + \sin \theta)(\sin \theta + \cos \theta)$ is minimum in the interval $(0, 2\pi)$?
a. infinite number of points b. exactly four points c. exactly one point d. exactly two points e. no point
- In a same way that the pattern 24685 gives 33776, pattern 35791 will give
a. 46682 b. 44682 c. 44826 d. 44880 e. none of these

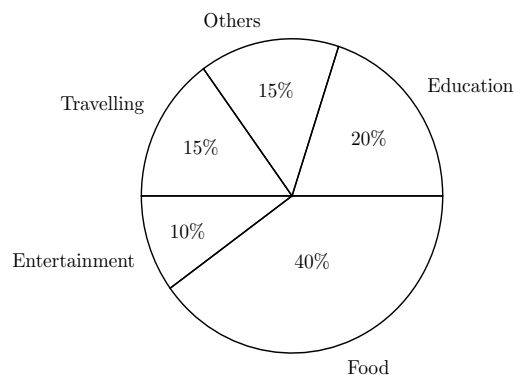
13. Let $\mathbf{A}$ and $\mathbf{B}$ be two 3×3 matrices and $\text{rank}(\mathbf{AB})$ is equal to 1, then the $\text{rank}(\mathbf{BA})$ cannot be
a. 2 b. 3 c. 1 d. 0 e. none of these
14. For any $a, b, c > 0$, which of the following is correct?
a. $(1+a)(1+b)(1+c) = 8\sqrt{abc}$ b. $(1+a)(1+b)(1+c) \geq \sqrt{abc}$ c. $(1+a)(1+b)(1+c) \geq 8\sqrt{abc}$
d. $(1+a)(1+b)(1+c) \leq 8\sqrt{abc}$ e. $(1+a)(1+b)(1+c) \leq \sqrt{abc}$
15. In the beginning of year 2023, twelve new magazines appeared in the market. Four of these magazines were on current affairs, six were entertainment magazines, and two were women magazines. By middle of the year, only six of these new magazines were still circulating in the market. Five of those that remained were entertainment magazines. Which of the following is a logically inference?
a. Only one of the women magazines remained in the market.
b. Only one of the current affairs magazines remained in the market.
c. At least one of the women magazines was cancelled.
d. Sale of entertainment magazines is more than others.
e. Magazine readers prefer entertainment ones to others.
16. For any $n > 0$, which of the following is correct?
a. $(\frac{n+1}{2})^n \geq n!$ b. $(\frac{n+1}{2})^n \geq (n!)^2$ c. $(\frac{n+1}{2})^n = n!$ d. $(\frac{n+1}{2})^n \geq (n!)^3$ e. $(\frac{n+1}{2})^n < n!$
17. A is a regular hexagon with sides of length 2. What is the area of the hexagon?
a. $6\sqrt{3}$ b. $8\sqrt{3}$ c. $2\sqrt{3}$ d. $4\sqrt{3}$ e. $3\sqrt{3}$
18. Let an isosceles right angled triangle Δpqr have right angle $\angle q$ and $|\overline{pq}| = 4$ units. Let $\overline{qs}$ be the perpendicular dropped from q on the line $\overline{pr}$. What is the length $|\overline{qs}|$ approximately?
a. 4 units b. 3 units c. 2.8 units d. 1 unit e. 2 units
19. Suppose γ_1 and γ_2 are two non-intersecting closed and convex curves. What is the maximum number of common tangents that can be drawn on γ_1 and γ_2 ?
a. 1 b. 4 c. ∞ d. 2 e. 0
20. Let the two circles $x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$ and $x^2 + y^2 + 2g_2x + 2f_2y + c_2 = 0$ be orthogonal. Which of the following is correct?
a. $2g_1g_2 + 2f_1f_2 = c_1c_2$ b. $g_1g_2 + f_1f_2 = 2c_1 + 2c_2$ c. $g_1g_2 + f_1f_2 = c_1 + c_2$ d. $2g_1g_2 + 2f_1f_2 = c_1 + c_2$
e. $2g_1g_2 - 2f_1f_2 = c_1 - c_2$
21. If $\alpha \sin \theta - \beta \cos \theta = \gamma$, then the value of $\alpha \cos \theta + \beta \sin \theta$ is
a. $\frac{\gamma^2}{\sqrt{\alpha^2 + \beta^2 - \gamma^2}}$ b. $\alpha^2 + \beta^2 - \gamma^2$ c. $\sqrt{\gamma^2 - \beta^2 - \alpha^2}$ d. $\frac{\alpha^2 + \beta^2}{\sqrt{\alpha^2 + \beta^2 - \gamma^2}}$ e. $\sqrt{\alpha^2 + \beta^2 - \gamma^2}$
22. L , M and N are waiting in a queue meant for children to enter the zoo. There are 5 children between L and M . There are 8 children between M and N . There are 3 children ahead of N . Lastly, there are 21 children behind L . What is the minimum number of children in the queue?
a. 46 b. 40 c. 27 d. 41 e. 28
23. The maximum value of $z = x_1 - 7x_2$, subject to $2x_1 \geq 5$, $3x_1 - 35x_2 \leq 21$, $x_2 \leq 3$ is
a. 21 b. 0 c. $\frac{21}{2}$ d. 42 e. 20
24. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, Then the value of $\frac{2a^4b^2 + 3a^2e^2 - 5e^4f}{2b^6 + 3b^2f^2 - 5f^5}$ is
a. $\frac{a^3}{b^3}$ b. $\frac{a^3c}{b^3d}$ c. $\frac{a^5}{b^5}$ d. $\frac{a^4c}{b^4d}$ e. $\frac{a^3c^2}{b^3d^2}$
25. The sum of the series $1 + \frac{4}{5} + \frac{7}{25} + \frac{10}{125} + \dots$ to n terms is
a. $\frac{34}{16} - \frac{12n+6}{16 \times 5^{n-1}}$ b. $\frac{35}{16} - \frac{11n+8}{16 \times 5^{n-1}}$ c. $\frac{35}{16} - \frac{12n+7}{16 \times 5^{n-1}}$ d. $\frac{36}{16} - \frac{12n+8}{16 \times 5^{n-1}}$ e. $\frac{36}{16} - \frac{13n+7}{16 \times 5^{n-1}}$

Part B

26. Suppose $\mathbf{A}$ is an invertible matrix and $\mathbf{B}$ is not an invertible matrix. Which of the following is correct?
 a. $\mathbf{A} - \mathbf{B}$ is always invertible b. $\mathbf{AB}$ may or may not be invertible c. $\mathbf{A} + \mathbf{B}$ is always invertible
 d. $\mathbf{AB}$ is always invertible e. $\mathbf{A} + \mathbf{B}$ may or may not be invertible
27. Let $\mathbf{A}$ be a $n \times n$ matrix where n is odd. Matrix $\mathbf{B}$ is such that i -th column of $\mathbf{A}$ is equal to $((i+1) \bmod n)$ -th column of $\mathbf{B}$. Then which of the following statements are correct?
 a. $\det(\mathbf{A}) = \det(\mathbf{B})$ b. $\det(\mathbf{A}) \neq \det(\mathbf{B})$ c. $\det(\mathbf{A}) \leq \det(\mathbf{B})$ d. $\det(\mathbf{A}) = -\det(\mathbf{B})$ e. $\det(\mathbf{A}) \geq \det(\mathbf{B})$

For the questions 28–31 the context is as following.

Study the following the pie-chart and table which show monthly expenses of a family of four members, Revati, Fahad, Bala, and Anna. It is also known that the monthly income of the family is 2 lakh rupees and they kept 20% of their income as savings.



	Education	Food	Entertainment	Travelling	Others
Revati	10	30	20	20	25
Fahad	15	25	25	30	30
Bala	40	25	25	25	20
Anna	35	20	30	25	25

28. What is the total expenses of Fahad in rupees in a month?
 a. 36,000 b. 49,000 c. 52,600 d. 45,000 e. 39,200
29. What is the percentage increase in the amount which Anna enjoys for entertainment as compared to Bala for the same?
 a. 20% b. 10% c. 22% d. 18% e. 12%
30. The total expenses of Bala is approximately what percent of the total expenses of Revati?
 a. 117% b. 85% c. 120% d. 102% e. 127%
31. Find the total expenses on Education and on Entertainment of Anna in percentage of the total family income?
 a. 10% b. 12% c. 9.5% d. 6 e. 8%

Refer to the following information to answer questions 32–34.

Ten coins are distributed among four people P , Q , R and S such that one of them gets one coin, another gets two coins, yet another gets three coins and the last one gets four coins. It is known that Q gets more coins than P and S gets fewer coins than R .

32. Let the number of coins distributed to Q be twice the number distributed to P . Which of the following is always true?
 a. P gets an odd number of coins. b. R gets an odd number of coins. c. S gets an even number of coins.
 d. R gets an even number of coins. e. S gets an odd number of coins.
33. Let R get at least two more coins than S . Which of the following is always true?
 a. Q gets less coins than R . b. Q gets at least two more coins than S c. S gets more coins than P .
 d. P and Q together get at least five coins. e. None of the above

34. Let Q get fewer coins than R . Which of the following is not always true?
- a. R and P together get at least five coins. b. P and Q together get at least four coins. c. R and S together get at least five coins. d. P and S together get at least three coins. e. Q and S together get at least four coins.
35. There are five letters and five envelopes with their correct addresses. How many ways can the letters be put into the envelopes so that all letters are put incorrectly?
- a. 120 b. 9 c. 24 d. 44 e. 60
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