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**RAJASTHAN BOARD OF
SECONDARY EDUCATION**

2023

**CLASS
XII**

Question Paper

Date: 31 March 2023 | TIME : (08:30 a.m. to 11:45 a.m)

Duration: 3 hr 15 min. | Max. Marks: 80



SUBJECT: MATHEMATICS

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This solution was download from Resonance Solution portal

SS-15-Mathematics

Roll No.

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SENIOR SECONDARY EXAMINATION, 2023 MATHEMATICS

Time Allowed : 3 hours 15 Minutes

Maximum Marks : 80

GENERAL INSTRUCTIONS TO THE EXAMINEES:






1. Candidate 'must write first his / her Roll No. on the question paper compulsorily.
2. All the questions are compulsory.
3. Write the answer to each question in the given answer-book only.
4. For questions having more than one part, the answers to those parts are to be written together in continuity.
5. If there is any error / difference / contradiction in Hindi & English version of the question paper, the question of Hindi version should be treated valid.
6. Write down the serial number of the question before attempting it.
7. Question No. 17 to 23 having internal choice.
8. Solve Question number 23 on graph paper.

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SECTION – A

Multiple Choice Questions:






- (i) If $f : R \rightarrow R, f(x) = \sin x$ and $g : R \rightarrow R, g(x) = X^2$ then $(f \circ g)(x)$ is equal to [1]
 (1) $\sin x^2$ (2) $\sin x$ (3) $\sin^2 x^2$ (4) $\sin^2 x$
- (ii) If the order of a matrix is $m \times n$, then the number of elements in it are, - [1]
 (1) m (2) n (3) mn (4) $m-n$
- (iii) If $y = x \cdot \log_e x$, then the value of $\frac{d^2y}{dx^2}$ will be [1]
 (1) $\frac{1}{1+x}$ (2) $\frac{1}{x}$ (3) $\log_e(1+x)$ (4) $1+\log_e x$
- (iv) The anti-derivative of $(\sqrt{x} + \frac{1}{\sqrt{x}})$ with respect to x [1]
 (1) $\frac{1}{3}x^{\frac{1}{3}} + 2x^{\frac{1}{2}} + C$ (2) $\frac{2}{3}x^{\frac{2}{3}} + \frac{1}{2}x^2 + C$
 (3) $\frac{2}{3}x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + C$ (4) $\frac{3}{2}x^{\frac{3}{2}} + \frac{1}{2}x^{\frac{1}{2}} + C$
- (v) The value of $\int \cos^2 x \, dx$ is [1]
 (1) $\frac{x}{2} + \frac{1}{4} \sin 2x + C$ (2) $x^2 + \frac{1}{4} \sin 2x + C$
 (3) $\frac{x}{4} + \frac{1}{2} \sin x + C$ (4) $\frac{x^2}{4} + \frac{1}{2} \sin^2 x + C$
- (vi) The area of the region bounded by the curve $y = X^2$ and the line $y = 4$ is [1]
 (1) $\frac{33}{2}$ (2) $\frac{8}{3}$ (3) $\frac{32}{3}$ (4) $\frac{4}{3}$
- (vii) The value of $\hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j})$ is - [1]
 (1) 0 (2) -1 (3) 1 (4) 3
- (viii) If the magnitude of two vectors \vec{a} and \vec{b} are $\sqrt{3}$ and 2 respectively and $\vec{a} \cdot \vec{b} = \sqrt{6}$, then the angle between \vec{a} and \vec{b} is [1]
 (1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$

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(ix) The equation of the plane with intercepts of 2, 3 and 4 on the x, y and z-axes respectively is – [1]

- (1) $4x + 6y + 3z = 12$ (2) $6x + 4y + 3z = 12$
 (3) $3x + 4y + 6z = 12$ (4) $5x + 4y + 3z = 12$

(x) If $P(A) = \frac{7}{13}$, $P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, then the value of $P(A/B)$ is – [1]

- (1) $\frac{4}{9}$ (2) $\frac{7}{9}$ (3) $\frac{5}{9}$ (4) $\frac{5}{13}$

(xi) If a pair of dice is thrown, then the probability of getting an even prime number on each die is - [1]

- (1) 0 (2) $\frac{1}{3}$ (3) $\frac{1}{12}$ (4) $\frac{1}{36}$

(xii) If a coin is tossed three times, where E: head on third toss; F: heads on first two tosses, then the value of $P(E/F)$ is - [1]

- (1) $\frac{1}{8}$ (2) $\frac{1}{2}$ (3) $\frac{1}{4}$ (4) $\frac{1}{3}$

2. Fill in the blanks:

(i) If $x \begin{bmatrix} 2 \\ 3 \end{bmatrix} + y \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$, then $(x + y) =$ _____. [1]

(ii) The derivative of $\cos(\sqrt{x})$ with respect to x is _____. [1]

(iii) The slope of the tangent line at $x = 4$ to the curve $y = 3x^4 - 4x$ will be _____. [1]

(iv) The value of $\int x^2 \left(1 - \frac{1}{x^2}\right) dx$ will be _____. [1]

(v) If the coordinates of the points A, B, C and D are then (1,2,3), (4, 5, 7), (-4, 3, -6) and (2, 9, 2) respectively, the acute angle between the lines AB and CD will be _____. [1]

(vi) If a pair of two unbiased dice is thrown once, then the probability that the sum of the numbers on both the dice is 5 will be _____. [1]

3. Very short answer type questions:

(i) Find the principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$. [1]

(ii) Find the values of x and y from the following equation: [1]






$$2 \begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

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- (iii) Evaluate $\begin{vmatrix} 102 & 18 & 36 \\ 1 & 3 & 4 \\ 17 & 3 & 6 \end{vmatrix}$ [1]
- (iv) Examine the continuity of the function $f(x) = 2x^2 - 1$ at $x = 3$ [1]
- (v) The total revenue in Rupees received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue, when $x = 7$ [1]
- (vi) Find the area of the region bounded by $y^2 = 9x$; $x = 2$, $x = 4$ and the x -axis in the first quadrant. [1]
- (vii) Find the position vector of a point R which internally divides the line joining two points P and Q whose position vectors are $(\hat{i} + 2\hat{j} - \hat{k})$ and $(-\hat{i} + \hat{j} + \hat{k})$ respectively in the ratio 2 : 1. [1]
- (viii) Find the angle between the vectors $(\hat{i} - 2\hat{j} + 3\hat{k})$ and $(3\hat{i} - 2\hat{j} + \hat{k})$. [1]
- (ix) Show that the line through the points $(1, -1, 2)$ and $(3, 4, -2)$ is perpendicular to the line through the points $(0, 3, 2)$ and $(3, 5, 6)$. [1]
- (x) The cartesian equation of a line is $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$. Write its vector form. [1]
- (xi) Find the intercepts cut off by the plane $2x + y - z = 5$ on co-ordinate axes. [1]
- (xii) An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B. [1]

SECTION - B

Short answer type questions:






4. If $f(x) = \frac{(4x+3)}{(6x-4)}$, $x \neq \frac{2}{3}$, show that $(f \circ f)(x) = x$ for all $x \neq \frac{2}{3}$. [2]
5. If $A = \begin{bmatrix} \sin\alpha & \cos\alpha \\ -\cos\alpha & \sin\alpha \end{bmatrix}$, then verify that $A'A = I$. [2]
6. Prove that $\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$ [2]
7. Show the points A $(a, b + c)$, B $(b, c + a)$ and C $(c, a + b)$ are collinear. [2]

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8. Prove that the function f given by $f(x) = \begin{cases} x^2 + 3 & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases}$ is not continuous at $x = 0$. [2]
9. Find the intervals in which the function f given by $f(x) = x^2 - 4x + 6$ is [2]
(i) Increasing
(ii) Decreasing
10. Find the approximate change in the volume of a cube of side x meters caused by increasing the side by 2%. [2]
11. Evaluate $\int \frac{\sec^2 x}{\sqrt{\tan^2 x + 4}} dx$. [2]
12. Find the area of the region bounded by the parabola $y^2 = 4ax$ and its latus rectum. [2]
13. Form the differential equation of the family of circles touching the y -axis at origin. [2]
14. For given vectors $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - \hat{k}$, find the unit vector in the direction of the vector $\vec{a} + \vec{b}$. [2]
15. Find the angle between the planes whose vector equations are $\vec{r} \cdot (2\hat{i} + 2\hat{j} - 3\hat{k}) = 5$ and $\vec{r} \cdot (3\hat{i} - 3\hat{j} + 5\hat{k}) = 3$ [2]
16. If a fair coin is tossed 10 times, find the probability of exactly six heads. [2]

SECTION - C






17. If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then find the value of x . [3]
OR
Show that $\sin^{-1}\frac{3}{5} - \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{84}{85}$. [3]
18. Differentiate $(\log x)^{\cos x}$ with respect to x . [3]
OR
If $y = 500e^{7x} + 600e^{-7x}$, show that $\frac{d^2y}{dx^2} = 49y$. [3]
19. Evaluate $\int \frac{1}{\sqrt{(x-1)(x-2)}} dx$. [3]
OR
Evaluate $\int \frac{x^2 + 1}{x^2 - 5x + 6} dx$. [3]

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20. Show that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ form the vertices of a right angled triangle. [3]

OR

Find the area of a triangle having the points A (1, 1, 1), B(1, 2, 3) and C (2, 3, 1) as its vertices. [3]

SECTION – D

21. Evaluate $\int_{-1}^1 5x^4 \sqrt{x^5 + 1} dx$. [4]

OR

Evaluate $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin^2 x dx$. [4]

22. In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs. 1,000 is deposited with this bank. How much will it worth after 10 years ($e^{0.5} = 1.648$). [4]

OR

Find the general solution of the differential equation $ydx - (x + 2y^2) dy = 0$. [4]

23. Maximize $Z = 5x + 3y$ subject to constraints $3x + 5y \leq 15$, $5x + 2y \leq 10$, $x \geq 0$, $y \geq 0$ by using graphical method. [4]

OR






Minimize $Z = 200x + 500y$ subject to constraints $x + 2y \geq 10$, $3x + 4y \leq 24$, $x \geq 0$, $y \geq 0$ by using graphical method [4]

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CUET (UG)

2023

Common University Entrance Test



About CUET (UG)

Common University Entrance Test (CUET) is the program that provides equal opportunity to all students from different Boards & different region.

- CUET, known as Common Universities Entrance Test (CUET), is a Computer Based All - India Test for admission to various Undergraduate Programmes in 44 Central Universities and other State Private + Deemed Universities of India.
- CUET (UG) is organized by National Testing Agency (NTA).
- Official Website: <www.samarth.cuet.ac.in> OR <www.cuet.nta.ac.in>

Points to Remember: CUET (UG) 2023

- Candidates can choose any Language/Domain Specific Subjects/General Test or a combination as per the requirements of the course in the specific University.
- The choice of Tests/Subjects depend on the course/s chosen by the candidate and the University/ies where admission is sought.
- A Candidate can take a maximum of **10 tests**.



S.No.	SECTION	NO. OF QUESTIONS	QUESTIONS TO ATTEMPT	DURATION
1.	SECTION-I (A+B)	50	40	45 Minutes
2.	SECTION-II	50/45	40/35	45 Minutes*
3.	SECTION-III	60	50	45 Minutes*

*Not yet announced by NTA.

- **Section IA – 13 Languages (As a medium and “Language”)**

Assamese | Bengali | English | Gujarati | Hindi | Kannada | Malayalam | Marathi | Odia | Punjabi | Tamil | Telugu | Urdu

- **Section IB – 20 Languages**

Arabic | Bodo | Chinese | Dogri | French | German | Persian | Russian | Sindhi | Tibetan | Italian | Japanese | Kashmiri | Konkani | Maithili | Manipuri | Nepali | Santhali | Spanish | Sanskrit

- **Section II – 27 Domain-Specific Subjects**

There are 27 Domains specific Subjects being offered under this Section. Candidate may choose a maximum of Six (06) Domains as desired by the applicable University/Universities.

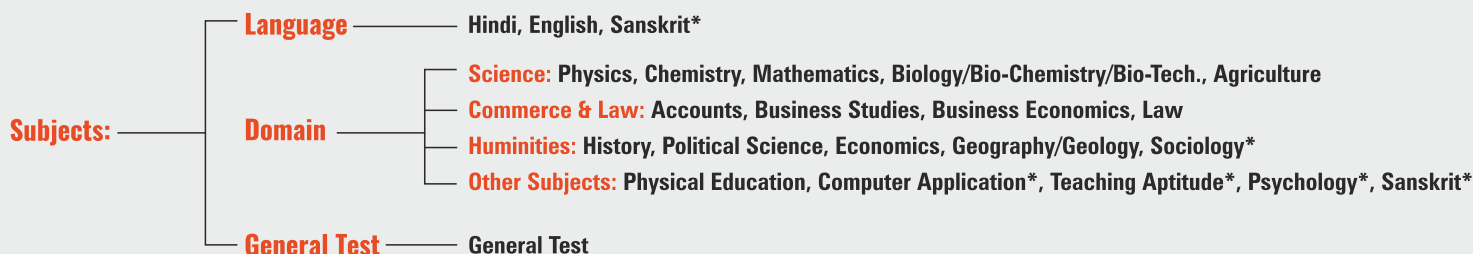
- **Section III – General Test**

General Knowledge, Current Affairs, General Mental Ability, Numerical Ability, Quantitative Reasoning (Simple application of basic mathematical concepts arithmetic/algebra geometry/mensuration/stat taught till Grade 8).

- Candidates, from any Stream (Arts / Commerce / Science), who are appearing in Class12th Examination in 2022-23 OR who have Passed the class 12th or equivalent examination, irrespective of their age can appear in the CUET (UG)–2023.
- Students of Science stream can explore some unique courses of B. Tech/ M. Tech / Bio-Tech courses through CUET exam at some renowned universities of India like DU / BHU etc.
- Candidates have to fulfil the age criteria if it is specified by a Particular University to which the candidate wishes to apply.

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* Availability of these subjects depends on number of students enrolled.

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