

ATP Education

Model Sample Paper 2016-17 (Annual Examination)

Class – 12 (CBSE)

Subject: Mathematics

Timing: 3 Hours]

Set-1

[Maximum Marks : 100

General Instructions:

- All questions are compulsory.
- The question paper consists of 29 questions divided into four sections A, B, C and D. Section A comprises of 4 questions of one mark each, Section B comprises of 8 questions of two marks each, Section C comprises of 11 questions of 4 marks each and Section D comprises of 6 questions of 6 marks each.
- A questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- There is no overall choice. However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- Use of Calculators is not permitted.

सामान्य निर्देश –

- सभी प्रश्न अनिवार्य हैं।
- इस प्रश्न-पत्र में 29 प्रश्न हैं जो कि चार खण्डों में विभाजित हैं – अ, ब, स तथा द। खण्ड 'अ' में 4 प्रश्न हैं जिनमें से प्रत्येक एक अंक का है। खण्ड 'ब' में 8 प्रश्न हैं जिनमें प्रत्येक दो अंक का है। खण्ड 'स' में 11 प्रश्न हैं जिनमें से प्रत्येक 4 अंक का है व खण्ड 'द' में 6 प्रश्न हैं जिनमें प्रत्येक 6 अंक का है।
- खण्ड 'अ' में सभी प्रश्नों के उत्तर एक शब्द, एक वाक्य अथवा प्रश्न की आवश्यकता अनुसार दिए जा सकते हैं।
- पूर्ण प्रश्न-पत्र में विकल्प नहीं है फिर भी चार प्रश्नों में तथा छः अंकों वाले दो प्रश्नों में आंतरिक विकल्प हैं। ऐसे सभी प्रश्नों में से आपको एक ही विकल्प करना है।
- कैलकुलेटर के प्रयोग की अनुमति नहीं है।

SECTION-A (1 Mark)

Q1. For what value of λ , the nature A is a singular matrix where

$$A = \begin{bmatrix} 1 & 3 & \lambda + 2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$$

Q2. Find the value of a for which the function $F(x) = x^2 - 2ax + 6$, $x > 0$ is strictly increasing



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Q3. Evaluate : $\hat{i}(\hat{j} \times \hat{k}) + (\hat{i} \times \hat{k}).\hat{j}$

Q4. If a line makes angle α , β and γ with co-ordinate axis then what is the value of

$$\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = ?$$

SECTION-B (2 Marks)

Q5. $\int \sin 3x \cos 3x \, dx$

Q6. Find the angle between the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$

Q7. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the even number on the drawn card is more than 3, what is the probability that it is an even number?

Q8. Consider $f: N \rightarrow N$, $g: N \rightarrow N$ and $h: N \rightarrow R$ defined as $f(x) = 2x$, $g(y) = 3y + 4$ and $h(z) = \sin z$, $\forall x, y$ and z in N . Show that : $ho(gof) = (hog)$ of

Q9. If A is a square matrix such that $a^2 = I$, the find the simplified value of :

$$(A - I)^3 + (A + I)^3 - 7A$$

Q10. If vectors $\vec{a}$ and $\vec{b}$ are such that

$$|\vec{a}| = \frac{1}{2}, |\vec{b}| = \frac{4}{\sqrt{3}}, |\vec{a} \times \vec{b}| = \frac{1}{\sqrt{3}} \text{ then find } |\vec{a} \cdot \vec{b}| = ?$$

Q11. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -4 \\ 3 & -2 \end{bmatrix}$, find $|AB|$

Q12. Find the vector equation of the plane with intercepts 3, -4, 2 on x, y and z- axis respectively.

SECTION-C (3 Marks)

Q13. Find $\int \frac{\sqrt{x}}{\sqrt{a^3 - x^3}} \, dx$

Q14. Find the particular solution of the differential equation:

$$(1 - y^2) (1 + \log x) \, dx + 2xy \, dy = 0, \text{ given that } y = 0 \text{ when } x = 1$$

Or

Find the general solution of the following differential equation:

$$(1 + y^2) + (n - e^{\tan^{-1} y}) \frac{dy}{dx} = 0$$

Q15. Evaluate : $\int_{-1}^2 |x^3 - x| \, dx$



Q16. Solve for x : $\tan(x - 1) + \tan^{-1}x + \tan^{-1}(x + 1) = \tan^{-1}3x$

Q17. A company has two plants of scooter manufacturing. Plant I manufacture 70% Scooter and plant II manufactures 30%. At plant I 80% of the scooter's are maintaining pollution norms and in plant II 90% of the scooter maintaining Pollution norms. A Scooter is chosen at random and is found to be fit on pollution norms. What is the probability that it has come from plant II. What is importance of pollution norms for a vehicle? (Value Based)

Q18. Find $\frac{dy}{dx}$ if $y = \sin^{-1} \left[\frac{6x - 4\sqrt{1 - 4x^2}}{5} \right]$

Q19. Find : $\int \frac{(2x-5)e^{2x}}{(2x-3)^3} dx$

Or

Find : $\int \frac{x^2 + x + 1}{(x^2 + 1)(x + 2)} dx$

Q20. Find all points of discontinuity of f , where f is defined by

$$\text{If } f(x) = \begin{cases} |x| + 3, & \text{if } x \leq -3 \\ -2x, & \text{if } -3 < x < 3 \\ 6x + 2, & \text{if } x \geq 3 \end{cases}$$

Q21. Find the equation of the plane passing through the point $(-1, 3, 2)$ and perpendicular to each of the planes $x + 2y + 3z = 5$ and $3x + 3y + z = 0$.

Q22. A bag x contains 4 white balls and 2 black balls, while another bag y contains 3 white ball and 3 black balls. Two balls are drawn (without replacement) at random from one of the bags and were found to be one white and one black. Find the probability that the balls were drawn from bag y .

Or

A and B throw a pair of dice alternatively, till one of them gets a 6 and wins the game. Find their respective probabilities of winning, if A starts first.

Q23. Find : $\int \left[\log(\log x) + \frac{1}{(\log x)^2} \right] dx$

SECTION-D (6 Mark)

Q24. Let $f: \mathbb{N} \rightarrow \mathbb{N}$ be a function defined as $f(x) = 9x^2 + 6x - 5$. Show that $f: \mathbb{N} \rightarrow S$, where S is the range of f , is invertible. Find the inverse of F and hence find $f^{-1}(43)$ and $f^{-1}(163)$.

Q25. Using integration find the area of the region $\{(x, y): x^2 + y^2 \leq 2ax, y^2 \geq ax\}$

Q26. $\int_0^{\frac{3}{2}} |\pi \cos \pi x| dx = ?$

Q27. A diet is to contain at least 80 units of vitamin A and 100 units of mineral. Two f_1 and f_2 are available costing ₹ 5 per unit and ₹ 6 per unit respectively. One unit of food f_1 contains 4 units of vitamin A and 3 units of minerals whereas one unit of food f_2 contains 3 units of vitamin A and 6 units of mineral. Formulate this as a linear programming problem. Find the minimum cost of diet that consists of mixture of these two foods and also meet the minimum nutritional requirement.

Q28. Show that the altitude of the right circular cone of minimum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3}$. Also find minimum value.

Q29. Solve $\int 2 \tan^{-1} x^2 dx$.

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The Best Of Luck
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