TARGET MATHEMATICS
THE EXCELLENCE KEY
AGYAT GUPTA (M.Sc., M.Phil.)

22 YEAR OF QUALITY EDUCATION

CODE:- AG-TS-2-3689 **REG.NO:-TMC -D/79/89/36**

General Instructions :-

1. All question are compulsory.
2. The question paper consists of 29 questions divided into three sections A,B and C. Section – A comprises of 10 question of 1 mark each. Section – B comprises of 12 questions of 4 marks each and Section – C comprises of 7 questions of 6 marks each .
3. There is no overall choice. However, internal choice has been provided in 4 question of four marks and 2 questions of six marks each. You have to attempt only one lf the alternatives in all such questions.
4. Use of calculator is not permitted.
5. Please check that this question paper contains 6 printed pages.
6. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

सामान्य निर्देश :

1. सभी प्रश्न अनिवार्य हैं।
2. इस प्रश्न पत्र में 29 प्रश्न है, जो 3 खण्डों में अ, ब, व स है। खण्ड – अ में 10 प्रश्न हैं और प्रत्येक प्रश्न 1 अंक का है। खण्ड – ब में 12 प्रश्न हैं और प्रत्येक प्रश्न 4 अंको के हैं। खण्ड – स में 7 प्रश्न हैं और प्रत्येक प्रश्न 6 अंको का है।
3. प्रश्न संख्या 1 से 10 बहुविकल्पीय प्रश्न हैं। दिए गए चार विकल्पों में से एक सही विकल्प चुनें।
4. इसमें कोई भी सर्वोपरि विकल्प नहीं है, लेकिन आंतरिक विकल्प 4 प्रश्न 4 अंको में और 2 प्रश्न 6 अंको में दिए गए हैं। आप दिए गए विकल्पों में से एक विकल्प का चयन करें।
5. कैलकुलेटर का प्रयोग वर्जित हैं ।
6. कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ 6 हैं।
7. प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर–पुस्तिका के मुख–पृष्ठ पर लिखें।

Time : 3 Hours — अधिकतम समय : 3
Maximum Marks : 100 — अधिकतम अंक : 100

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Total No. Of Pages :6 — कुल पृष्ठों की संख्या : 6

PRE-BOARD EXAMINATION 2013 -14

CLASS – XII **CBSE** **MATHEMATICS**

PART – A

Q.1 Find the point at which the tangent to the curve $y = \sqrt{4x-3} - 1$ has its slope $\frac{2}{3}$.

Q.2 Evaluate; $\int \cot x(\operatorname{cosec} x - 1)e^x dx$.

Q.3 Evaluate: $\int \frac{\cos x - \sin x}{1 + \sin 2x} dx$.

Q.4 Write the I.F. of the differential equation $(2x - 10y^3)dy + ydx = 0$.

Q.5 The money to be spent for the welfare of the employees of a firm is proportional to the rate of change of its total revenue (marginal revenue). If the total revenue (in rupees) received from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$ find the marginal revenue, when x = 5, and write which value does the equations indicate.

Q.6 The order and degree of the differential equation $\frac{d^2y}{dx^2} = \left\{y + \left(\frac{dy}{dx}\right)^2\right\}^{1/5}$.

Q.7 Find the integrating factor for the linear differential equation: $(y^2 - 1) + 2xy\frac{dy}{dx} = \left(\frac{2}{y^2 - 1}\right)\frac{dy}{dx}$.

Q.8	Evaluate ; $\int 3\sqrt{x}\left(1+\sqrt{x^3}\right)dx$.
Q.9	Total cost C(x) associated with the provision of free mid-day meals to x students of a school in primary classes is given by $c(x) = .005\,x^3 - .02\,x^2 + 30\,x + 50$. If the marginal contentment is given by rate of change dc/ dx of total cost, then write the marginal cost of food for 300 students. What value is shown here?
Q.10	What is the approximate change in the volume V of a cube of side x meters caused by increasing the side by 2%?
	PART – B
Q.11	Solve the following differential equation: $\sqrt{1+x^2+y^2+x^2y^2}$ + x y $\frac{dy}{dx}=0$.
Q.12	Evaluate: $\int \frac{e^{\tan^{-1}x}}{\left(1+x^2\right)^2}$ **dx .** **OR** Evaluate ; $\int (2\sin 2x - \cos x)\sqrt{6-\cos^2 x - 4\sin x}\,dx$.
Q.13	Find the particular solution of the differential equation $(xdy - ydx)\,y.\sin\left(\frac{y}{x}\right) = (ydx + xdy)\,x\cos\frac{y}{x}$, given that $y=\pi$ when x = 3 .
Q.14	(i) Water is dripping out at a steady rate of 1 cu cm/sec through a tiny hole at the vertex of the conical vessel, whose axis is

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	vertical. When the slant height of water in the vessel is 4 cm, find the rate of decrease of slant height, where the semi vertical angle of the conical vessel is $\pi/6$. (ii)Using differentials, find the approximate value of $\sqrt{.082}$.
Q.15	Show that the differential equations 2y $e^{x/y}$ dx + (y – 2x $e^{x/y}$)dy = 0 is homogeneous and find its particular solution given that x = 0 when y = 1.
Q.16	Form the differential equation of the family of curve $y = ae^x + be^{2x} + ce^{3x}$; where a, b, c are some arbitrary constants.
Q.17	(a) Separate the interval $\left[0,\frac{\pi}{2}\right]$ into subintervals in which $f(x)=\left(\sin^4 x+\cos^4 x\right)$ is, (i) increasing (ii) decreasing . (b)Find the intervals in which the function f given by $f(x) = x^3+\frac{1}{x^3}, x\neq 0$ is (i) increasing (ii) decreasing .
Q.18	A ladder 20m long has one end on the ground and the other end in contact with a vertical wall. The lower end slips along the ground. Show that when the lower end of the ladder is 16m away from the wall, the upper end is moving 4 / 3 times as fast as the lower end.
Q.19	Find the particular solution of the differential equation cos x dy = sin x (cos x – 2y) dx, given that y = 0 when $x=\frac{\pi}{3}$.
Q.20	The marginal cost is defined as the rate of change of total cost with respect to the number of units of the product. The marginal cost of producing x units of a product is given by Marginal Cost = $2x\sqrt{x+5}$. If the cost of producing 4 units of the product is

	₹314.40, find the cost function. OR Prove that the curve $xy = a^2$ and $x^2 + y^2 = 2a^2$ touch each other.
Q.21	A given rectangular area is to be fenced off in a field whose length lies along a straight river. If no fencing is needed along the river, show that the least length of fencing will be required when length of the field is twice its breadth. **OR** For the curve $y = x^2 + 3x + 4$ find all point at which the tangent passes through origin.
Q.22	Evaluate: $\int_0^{\pi/2} \sin 2x \tan^{-1}(\sin x)\,dx$. **OR** Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\cos^2 x}{\cos^2 x + 4\sin^2 x}dx$.
	PART – C
Q.23	Evaluate: $\int_0^{\pi/2} \log \cos ec x\,dx$. OR Evaluate: $\int_0^1 x\left(\tan^{-1} x\right)^2 dx$.
Q.24	Evaluate $\int_1^2 \left(x^2 + x + 2\right)dx$ as a limits of sum .

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Q.25	Using integration, find the area of the triangle bounded by the lines x + 2y = 2, y – x = 1 and 2x + y = 7.
Q.26	In a school the school management committee wants to built a hall in the school . During the meeting it was decided that there should be 8 windows of same size in the hall for proper light and fresh air . Each window be in the form of rectangle surmounted by equilateral triangle . The total perimeter of each window is 15 meter . Find the dimensions of the rectangular part of each window so as to admit maximum light and fresh air through the whole opening . Write the two value points behind the decision .
Q.27	Using integration find the area of the region $\left\{(x, y): x^2 + y^2 \le 1 \le x + \frac{y}{2}\right\}$.
Q.28	Find the shortest distance of the point $(0, c)$ from the parabola $y = x^2$, where $0 \le c \le 5$. **OR** An isosceles triangle of vertical angle 2θ is inscribed in a circle of radius *a*. Show that the area of triangle is maximum when $\theta = \frac{\pi}{6}$.
Q.29	Make a rough sketch of the region given below and find its area using integration. $\{(x, y): 0 \le y \le x^2 + 3; 0 \le y \le 2x + 3; 0 \le x \le 3\}$.
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	UNLESS YOU BELIEVE, YOU WILL NOT UNDERSTAND.