पुणा International School
Shree Swaminarayan Gurukul, Zundal

Examination S A 2					
Student Name			Grade 12(Sci)	SET - A
Date			Subject	MATHEMATICS
		Time		Total Marks	80

General Instructions:

1. This question paper contains two parts A and B. Each part is compulsory. Part A carries 24 marks and Part B carries 56 marks

2. Part-A has Objective Type Questions and Part –B has Descriptive Type Questions

3. Both Part A and Part B have choices.

Part –A:

1. It consists of two sections-I and II.

2. Section I comprises of 16 very short answers type questions.

3. Section II contains 8 M C Q each carry 1 mark.

Part –B:

1. It consists of three sections-III, IV and V.

2. Section III comprises of 10 questions of 2 marks each

.3.SectionIV comprises of 7 questions of 3 marks each.

4. Section V comprises of 3 questions of 5 marks each

.5.Internal choice is provided in 3 questions of Section –III, 2 questions of Section-IV and 3 questions of Section-V. You have to attempt only one of the alternatives in all such questions.

Part –A

Section I

1. Check whether the function $f:R\rightarrow R$defined as $(x) = x^3$ is one-one or not.

OR

How many reflexive relations are possible in a set A whose $n\,(A) = 3$

2. A relation R in $S=\{1,2,3\}$is defined as $R=\{(1,1),(1,2),(2,2),(3,3)\}$. Which element(s) of relation R be removed to make R an equivalence relation?

3. A relation R in the set of real numbers R defined as $R = \{(a,) : \sqrt{a} = b\}$ is a function or not. Justify

OR

An equivalence relation R in A divides it into equivalence classes $A1,2,A3$. What is the value of $A_1 \cup A_2 \cup A_3$ and $A_1 \cap A_2 \cap A_3$

4. If A and B are matrices of order $3\times n$and $m\times 5$respectively, then find the order of matrix 5A –3B, given that it is defined

5. Find the value of A^2, where A is a 2×2 matrix whose elements are given by aij = {1 i $\neq j$ and 0 if $i=j$}

OR

Given that A is a square matrix of order 3×3 and |A|=-4. Find |adjA|

6. Let A = $[aij]$ be a square matrix of order 3×3 and |A|= -7. Find the value of $a_{11}A_{21}+ a_{12}A_{22} + a_{13} A_{23}$ where ij is the cofactor of element aij

7. Find $\int e^x (1-\cot x+cosec\ ^2 x)\ dx$

OR

Evaluate $\int x^2 \sin x dx$

8. Find the area bounded by $y=x^2$,$he\ x$–axis and the lines $x = -1$ and $x = 1$

9. How many arbitrary constants are there in the particular solution of the differential equation

$\frac{dy}{dx} = -4xy^2$; y (0) = 1

OR

For what value of n is the following a homogeneous differential equation: $\frac{dy}{dx} = \frac{x^3 - y^n}{x^2y - xy^2}$

10. Find a unit vector in the direction opposite to $-\frac{3}{4}\hat{j}$

11. Find the area of the triangle whose two sides are represented by the vectors $2\hat{\imath}\ and\ -3\hat{j}$

12. Find the angle between the unit vectors $\hat{a}\ and\ \hat{b}$, given that $|\hat{a} + \hat{b}| = 1$

13. Find the direction cosines of the normal to YZ plane?

14. Find the coordinates of the point where the line x+33=y−1−1=z−5−5cuts the XY plane.

15. The probabilities of A and B solving a problem in dependently are 13and14respectively. If both of them try to solve the problem independently, what is the probability that the problem is solved?

16. The probability that it will rain on any particular day is 50%. Find the probability that it rains only on first 4 days of the week.

Section II

17. M C Q each carry 1 mark.(Any Four)

i) Let R be the relation in the set N given by R = {(a,b) : a=b – 2, b>6}. Then, the correct option is

a) (2, 4) ∈ **R** b) (3, 4)∈ **R** c) (6, 8) ∈ **R** d) (8, 7) ∈ **R**

ii) Let R be relation from R to R set of real numbers defined by R = {(x, y) : x, y∈ **R** and x-y+√3 is an irrational number}. Then, R is

a) Reflexive b) transitive c) Symmetric d) an equivalence relation

iii) The value of $\tan^2(\sec^{-1}2) + \cot^2(\mathrm{cosec}^{-1}3)$ is

a) 5 b) 13 c) 11 d) 15

iv) The equation $\tan^{-1}x - \cot^{-1}x = \tan^{-1}(1/\sqrt{3})$ has

a) No solution b) unique solutions c) Infinite number of solutions d) two solutions

v) If A is a square matrix such that $A^2 = A$, then $(I+A)^3 - 7A$ is equal to

a) A b) I-A c) I d) 3A

18. M C Q each carry 1 mark.(Any Four)

i) For any two matrices A and B, we have

a) AB=BA b) AB≠BA c) AB=O d) None of these

ii) Which of the following is incorrect?

a) Determinant is a square matrix b) Determinant is a number associated to a matrix

c) Determinant is a number associated to a square matrix d) None of above

iii) A square matrix A is said to be non-singular, if

a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = -1$ d) $|A| = 1$

iv) If y = x cosx, then d^2y/dx^2 is

a) –xcosx - 2sinx b) x cos x + 2sinx c) x sinx + cosx d) None of these

v) The distance covered by the particle in time t is given by $x = 3 + 8t - 4t^2$. After 1s, its velocity will be

a) 0 unit / s b) 3 units / s c) 4 units / s d) 7 units / s

Part –B

Section III

Comprises of 10 questions of 2 marks each

19. Express $tan^{-1}\left(\frac{cosx}{1-sinx}\right)$, $\frac{-3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.

20. If A is a square matrix of order 3 such that $A^2 = 2A$, then find the value of |A|.

OR

If $A = \begin{vmatrix} 3 & 1 \\ -1 & 2 \end{vmatrix}$, show that $A^2-5A+7I = O$. Hence find A^{-1}

21. Show that the relation R in the set { 1, 2, 3 } given by R = { (1, 2), (2, 1) } is symmetric but neither Reflexive nor Transitive

22. Find the equation of the normal to the curve $y = x + \frac{1}{x}$, $x > 0$ perpendicular to the line $3x-4y=7$

23. Find $\int \frac{1}{\cos^2 x\,(1-\tan^2 x)}\,dx$

OR

Evaluate $\int_0^1 x\,(1-x)^n\,dx$

24. Find the area of the region bounded by the parabola $y2=8x$and the line $x = 2$

25. Solve the following differential equation: $dy/dx = x^3\ cosecy$, $given\ that\ y$ (0) = 0.

26. Find the area of the parallelogram whose one side and a diagonal are represented by co initial vectors i – j + k and $4i + 5\hat{k}$ respectively.

27. Find the vector equation of the plane that passes through the point (1,0,0) and contains the line $\vec{r} = \lambda\, ĵ$.

28. A refrigerator box contains 2 milk chocolates and 4 dark chocolates. Two chocolates are drawn at random. Find the probability distribution of the number of milk chocolates. What is the most likely outcome?

OR

Given that E and F are events such that P(E) = 0.8, P(F) = 0.7, P (E∩F) = 0.6. Find P $(\bar{E}|\bar{F})$

Section IV

All questions are compulsory. In case of internal choices attempt any one.

29. Check whether the relation R in the set Z of integers defined as R = {$(a,)$: $a+b$ is "divisibleby2"} is reflexive, symmetric or transitive. Write the equivalence class containing 0 i.e. [0].

30. If y = $e^{x\sin^2 x}$ + (sin x) ^{x}, find dy/dx.

31. Prove that the greatest integer function defined by $(x) = [x]$, $0 < x < 2$ is not differentiable at $x = 1$

OR

If $x = a\ sec\theta, y = b\ tan\theta\ find\ d^2y/dx^2\ at\ x = \pi/6$

32. Find the intervals in which the function $f$given by (x) = tan$x$ – 4x, $x \in (0, \pi/2)$ is

a) Strictly increasing b) strictly decreasing

33. Find $\int \frac{x^2+1}{(x^2+2)(x^2+3)}$ dx

34. Find the area of the region bounded by the curves $x^2+y^2 = 4$, y = √3 $nd\ x{-}axis\ in\ the\ first\ quadrant$

OR

Find the area of the ellipse $x^2 + 9y^2 = 36$ using integration.

35. Find the general solution of the following differential equation: $xdy - (\ + 2x^2)\ dx = 0$

Section V

All questions are compulsory. In case of internal choices attempt any one.

36. Prove that $\begin{pmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{pmatrix} = 2\begin{pmatrix} a & p & x \\ b & q & y \\ c & r & z \end{pmatrix}$

OR

Prove that $\begin{pmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{pmatrix}$ = 4 a b c

37. Find gof and fog, if (x) = 8x³ and $g(x) = x^{\frac{1}{3}}$

OR

Find the foot of the perpendicular drawn from the point (-1, 3, -6) to the plane $2x+y-2z+5=0$. Also find the equation and length of the perpendicular.

38. Solve the following linear programming problem (L.P.P) graphically. Maximize $Z = x + 2y$

subject to constraints ; $x + 2y \geq 100$

$2x - y \leq 0$

$2x + y \leq 200$

$x, \geq 0$

OR

Let A = $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$. Find a matrix D such that CD – AB = 0