S S DIVINE SCHOOL

Std: 11th EM – MATHS ASSIGNMENT

Section A

- **Write the answer of the following questions. [Each carries 1 Mark]** **[28]**

1. Write the following sets in roster form : A = $\{x : x$ is an integer and $-3 \leq x < 7\}$
2. The set of prime numbers less than 99. Given set are finite or infinite ?
3. Make correct statement by filling in the symbol $\subset$ or $\not\subset$ in the blank spaces : $\{a, b, c\}$ ....., ..., $\{b, c, d\}$
4. Make correct statement by filling in the symbol $\subset$ or $\not\subset$ in the blank spaces : $\{x : x$ is an even natural number$\}$ ....., ..., $\{x : x$ is an integer$\}$
5. given statement are true or false : $\{a, b\} \not\subset \{b, c, a\}$
6. Find the union of given pair of set : A = $\{a, e, i, o, u\}$, B = $\{a, b, c\}$
7. If A and B are two sets such that A $\subset$ B, then what is A $\cup$ B ?
8. If the set A has 3 elements and the set B = {3, 4, 5}, then find the number of elements in (A $\times$ B).
9. True or False. If the statement is false, rewrite the given statement correctly : If A = {1, 2}, B = {3, 4}, then A $\times$ (B $\cap$ ϕ) = ϕ.
10. Find the radian measure corresponding to the 25° measure.
11. Find the radian measure corresponding to the –47° 30' measure.
12. Find the degree measures corresponding to the $\frac{5\pi}{3}$ radian measures. $\left(\text{Use } \pi = \frac{22}{7}\right)$
13. Find the degree measures corresponding to the $\frac{11}{16}$ radian measures. $\left(\text{Use } \pi = \frac{22}{7}\right)$
14. If in two circles, arcs of the same length subtend angles 60° and 75° at the centre, find the ratio of their radii.
15. Find the values of the trigonometric function : $\tan\left(\frac{19\pi}{3}\right)$
16. ..... is the remainder if P(n) : $3^{2n+2} - 8n$ is divided by 64.
17. For minimum value of n = ... statement P(n) : $2^n - 1$ is a prime number.
18. Statement P(n) : $n^3 + 3n^2 + 5n + 3$ is multiple of ..... smalled odd number.
19. Express the complex number given in the form $a + ib$: $i^9 + i^{19}$
20. Express the complex number given in the form $a + ib$: i^{-39}
21. Express the complex number given in the form $a + ib$: $3(7 + i\,7) + i\,(7 + i\,7)$
22. Express the complex number given in the form $a + ib$: $\left(\frac{1}{5} + i\,\frac{2}{5}\right) - \left(4 + i\,\frac{5}{2}\right)$
23. Solve : $24x < 100$, when (i) x is a natural number. (ii) x is an integer.
24. Solve $3x + 8 > 2$, when (i) x is an integer. (ii) x is a real number.
25. Solve : $-12x > 30$, when (i) x is a natural number. (ii) x is an integer.
26. Solve $5x - 3 < 7$ when, x is a real number.
27. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there ?
28. Given 5 flags of different colours, how many different signals can be generated if each signal requires the use of 2 flags, one below the other ?

Section B

● **Write the answer of the following questions. [Each carries 2 Marks]** **[90]**

29. In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English ?

30. In a group of 70 people, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. How many people like both coffee and tea ?

31. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket ? How many like tennis ?

32. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages ?

33. For any sets A and B, show that, $P(A \cap B) = P(A) \cap P(B)$.

34. Assume that $P(A) = P(B)$. Show that $A = B$.

35. Show that if $A \subset B$, then $C - B \subset C - A$.

36. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports ?

37. Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by $\{(a, b) : a, b \in A, b \text{ is exactly divisible by } a\}$.
    (i) Write R in roster form
    (ii) Find the domain of R
    (iii) Find the range of R.

38. Find the domain and range of the following real functions : $f(x) = \sqrt{9 - x^2}$

39. Let $f = \left\{\left(x, \frac{x^2}{1 + x^2}\right) : x \in R\right\}$ be a function from R into R. Determine the range of f.

40. If $f(x) = x^2$, then find $\frac{f(1 \cdot 1) - f(1)}{(1 \cdot 1 - 1)}$.

41. The relation f is defined by $f(x) = \begin{cases} x^2, & 0 \le x \le 3 \\ 3x, & 3 \le x \le 10 \end{cases}$ The relation g is defined by $g(x) = \begin{cases} x^2, & 0 \le x \le 2 \\ 3x, & 2 \le x \le 10 \end{cases}$ Show that f is a function and g is not a function.

42. Let R be a relation from N to N defined by $R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$. Are the following true ?
    (i) $(a, a) \in R$, for all $a \in N$
    (ii) $(a, b) \in R$, implies $(b, a) \in R$
    (iii) $(a, b) \in R$, $(b, c) \in R$ implies $(a, c) \in R$. Justify your answer in each case.

43. Find the values of other five trigonometric function : $\sec x = \frac{13}{5}$, x lies in fourth quadrant.

44. Find the values of the trigonometric function : cosec $(-1410°)$

45. Find the values of the trigonometric function : sin 765°

46. Find the values of the trigonometric function : $\sin\left(-\frac{11\pi}{3}\right)$

47. Prove that : $2\sin^2\left(\frac{\pi}{6}\right) + \text{cosec}^2\left(\frac{7\pi}{6}\right)\cos^2\left(\frac{\pi}{3}\right) = \frac{3}{2}$

48. Prove that : $2\sin^2\left(\frac{3\pi}{4}\right) + 2\cos^2\left(\frac{\pi}{4}\right) + 2\sec^2\left(\frac{\pi}{3}\right) = 10$

49. Prove that : $\cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right) = -\sqrt{2}\sin x$

50. Prove that : $\tan 4x = \frac{4\tan x\,(1 - \tan^2 x)}{1 - 6\tan^2 x + \tan^4 x}$

51. Find the principal and general solutions of the following equations : $\tan x = \sqrt{3}$

52. Find the principal and general solutions of the following equations : $\cot x = -\sqrt{3}$

53. Find the general solution of the following equations : $\sin 2x + \cos x = 0$

54. For triangle ABC, prove that : $\frac{a+b}{c} = \frac{\cos\left(\frac{A-B}{2}\right)}{\sin\frac{C}{2}}$

55. For triangle ABC, prove that : $\frac{a-b}{c} = \frac{\sin\left(\frac{A-B}{2}\right)}{\cos\left(\frac{C}{2}\right)}$

56. For triangle ABC, prove that : $\sin\frac{B-C}{2} = \frac{b-c}{a}\cos\left(\frac{A}{2}\right)$

57. Prove that : $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4\cos^2\frac{x+y}{2}$

58. Prove that : $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4\sin^2\frac{x-y}{2}$

59. Find the modulus and the arguments of the complex number in $z = -1 - i\sqrt{3}$

60. Convert the complex numbers given in $-1 - i$ the polar form.

61. Solve the following equations : $x^2 + 3 = 0$

62. Solve the following equations : $2x^2 + x + 1 = 0$

63. Solve the following equations : $-x^2 + x - 2 = 0$

64. Solve the following equations : $\sqrt{2}x^2 + x + \sqrt{2} = 0$

65. Solve the inequalities for real x : $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$

66. Solve the inequalities for real x : $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

67. Solve the inequalities and show the graph of the solution in case on number line : $5x - 3 \geq 3x - 5$

68. Solve the inequalities and show the graph of the solution in case on number line :

$$\frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$$

69. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of the digits is allowed ?

70. How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated ?

71. How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated ?

72. How many 3-digit numbers can be formed by using the digits 1 to 9 if no digit is repeated ?

73. How many 4-digit numbers are there with no digit repeated ?

Section C

● **Write the answer of the following questions. [Each carries 3 Marks]** **[54]**

74. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find :
(i) the number of people who read at least one of the newspapers.
(ii) the number of people who read exactly one newspaper.

75. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

76. For triangle ABC, prove that : $(b + c)\cos\left(\frac{B + C}{2}\right) = a\cos\left(\frac{B - C}{2}\right)$

77. Two ships leave a port at the same time. One goes 24 km per hour in the direction N 45°E and other travels 32 km per hour in the directions 575°E. Find the distance between the ships at the end of 3 hours.

78. Two trees A and B are the same side of a river. From point c in the river the distance of the trees A and B is 250m and 300m respectively. If the angle C is 45°, find the distance between the trees. $\left(\text{Use } \sqrt{2} = 1.44\right)$

79. For triangle ABC, prove that : $(b^2 - c^2)\cot A + (c^2 - a^2)\cot B + (a^2 - b^2)\cot C = 0$.

80. For triangle ABC, prove that : $a\cos A + b\cos B + c\cos C = 2a\sin B\sin C$

81. Prove the $1 \cdot 3 + 2 \cdot 3^2 + 3 \cdot 3^3 + \ldots\ldots + n \cdot 3^n = \frac{(2n - 1)3^{n+1} + 3}{4}$ by using the principle of mathematical induction for $n \in N$.

82. Prove the $x^{2n} - y^{2n}$ is divisible by $x + y$ by using the principle of mathematical induction for $n \in N$.

83. Prove the $(2n + 7) < (n + 3)^2$ by using the principle of mathematical induction for $n \in N$.

84. Prove the $1^3 + 2^3 + 3^3 + \ldots\ldots\ldots + n^3 = \left(\frac{n(n + 1)}{2}\right)^2$ by using the principle of mathematical induction for $n \in N$.

85. Prove the $a + ar + ar^2 + \ldots\ldots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}$ by using the principle of mathematical induction for $n \in N$.

86. Find the square root of the following : $-15 - 8i$

87. Find the square root of the following : $1 - i$

88. Find the square root of the following : i

89. If $x - iy = \sqrt{\frac{a - ib}{c - id}}$ then prove that, $\left(x^2 + y^2\right)^2 = \frac{a^2 + b^2}{c^2 + d^2}$.

90. If $a + ib = \frac{(x + i)^2}{2x^2 + 1}$, prove that $a^2 + b^2 = \frac{(x^2 + 1)^2}{(2x^2 + 1)^2}$.

91. Solve the equation of If $z_1 = 2 - i$, $z_2 = 1 + i$, find $\left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1}\right|$.