



Brilliant Public School
 Seepat Road Bahatarai, Bilaspur (C.G.)
 Final Term, 2017-18
 Class – XI
 Subject – Mathematics

Time: 3:00Hours
 Date: 15.02.2018

M.M. 100
 Thursday

General Instruction:

- All the 4 sections are compulsory.
- There is no overall choice however internal choice has been provided.
- Section A consist of 4 questions of one marks, section B consist of 8 questions of two marks and section C consists of 11 questions of four marks and section D of 6 questions of six marks each
- Use of calculator is strictly prohibited.

Section - A

- Using properties of sets, show that for any two sets A and B, $(A \cup B) \cap (A \cup B)^c = A$. 1
- Write the general term in the expansion $(x^2 - y)^6$. 1
- What is the probability that a number selected from the numbers 1, 2, 3 25 is a prime number, when each of the given numbers is equally likely to be selected. 1
- Find the general solution of the equation, $\sin x = -\frac{\sqrt{3}}{2}$ 1

Section - B

- Find the sum to n terms of the sequence given by $a_n = 5 - 6n$, for n belongs to N. 2
- In what ratio, the line joining (-1, 1) and (5, 7) is divided by the line $x + y = 4$? 2
- A circle of radius 6 units touches the coordinate axes in the first quadrant. Find the equation of its image in the line mirror $y = 0$. 2
- Find the locus of the point which is equidistant from the points A (0,2,3) and B (2,-2,1) 2
- Using binomial theorem, prove that $\sum_{r=0}^n 3^r {}^n C_r = 4^n$. 2
- Solve the inequality : $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$ 2
- Prove the rule of exponents $(a b)^n = a^n b^n$, by using principle of mathematical induction for every natural number. 2
- Find the number of 4 letter words, with or without meaning which can be formed out of the letters of the word ROSE, when
 - The repetition of the letters is not allowed
 - repetition of the letters is allowed. 2

SECTION - C

- Find the Domain and Range of 4
 - $f(x) = \frac{4-x}{x-4}$
 - $f(x) = \sqrt{x-3}$

14. Prove by mathematical induction $1.2.3 + 2.3.4 + 3.4.5 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$. 4

15. Prove that $-(\cos A + \cos B)^2 + (\sin A - \sin B)^2 = 4\cos^2\left(\frac{A+B}{2}\right)$ 4

16. How many four-letter words can be formed using the letter of the word INEFFECTIVE? 4
- (i) 3 alike letters and 1 distinct letter
 - (ii) 2 alike letters of one kind and 2 alike letters of the second kind
 - (iii) 2 alike letters and 2 distinct letters
 - (iv) All different letters.

17. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added? 4

18. If a, b, and c are in A.P., then prove that: $(a - c)^2 = 4(b^2 - ac)$. 4

19. Find the coordinates of the points which trisect the line segment AB, given that A (2,1,-3) and B (5,-8,3). 4

20. Consider the experiment of rolling a die. Let A be the event getting a prime number, B be the event getting an odd number. Write the sets representing the events (i) A or B (ii) A and B (iii) A but not B (iv) not A. 4

21. Calculate the mean deviation about median for the following data: 4

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	7	15	16	4	12

22. Show that the statement p: If x is a real number such that $x^3 + 4x = 0$, then x is 0, is true by (i) direct method (ii) method of contradiction (iii) method of contra positive. 4

23. Find the derivative of f(x) from the first principle, where f(x) is 4

(i) $\sin x + \cos x$

OR

(ii) $\sin 2x$

SECTION - D

24. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ for x not equal to 0, then show that a, b, c and d are in G.P. 6

25. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three newspapers, find the number of families which buy. 6

- (i) A only
- (ii) B only
- (iii) none of A,B and C.

26. If α and β are distinct roots of $a \cos \theta + b \sin \theta = c$, prove that $\sin(\alpha + \beta) = \frac{2ab}{a^2 + b^2}$. 6

27. The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, find the other two observations. 6

28. If $f(x) = \begin{cases} mx^2 + n, & x < 0 \\ nx + m, & 0 \leq x \leq 1. \\ nx^3 + m, & x > 1 \end{cases}$. For what integers m and n does both $\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow 1} f(x)$ exist? 6

29. A man running a racecourse notes that the sum of the distances from the two flag posts from him is always 10m and the distance between the flag posts is 8m. Find the equation of the posts traced by the man. 6

OR

If $a + ib = \frac{c+i}{c-i}$, where c is real, prove that $a^2 + b^2 = 1$ and $\frac{b}{a} = \frac{2c}{c^2 - 1}$.

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