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INDIAN SCHOOL SOHAR
SECOND TERM EXAMINATION– 2016
SUBJECT: MATHEMATICS

STD: XI **MARKS: 100**
DATE: 26 .11.16 **TIME: 3Hrs**

General Instructions:
(i) **All** questions are compulsory.
(ii) This question paper contains **29** questions.
(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
(v) Question **13-23** in **Section C** are long-answer-**I** type questions carrying **4** marks each.
(vi) Question **24-29** in **Section D** are long-answer-**II** type questions carrying **6** marks each.

SECTION – A

Questions 1 to 4 carry 1 mark each

1. Write the contrapositive of the following statement:
   "If a number is divisible by 9, then it is divisible by 3".
2. Find the image of (-2,3,-3) in the xz- plane.
3. Identify the type of "Or" used in the following statements and check whether the statement is true or false: "$\sqrt{2}$ is a rational number or an irrational number".
4. Evaluate : $\lim_{x\to 0} \frac{\sqrt{1+x}-1}{x}$

SECTION – B

Questions 5 to 12 carry 2 marks each.

5. Determine the domain and range of the following relation:
   S= { (a,b): b = $|a-1|, a \in Z \; and |a| \leq 3$}
6. Which is larger $(1.01)^{1000000}$ or 10,000?
7. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes?.
8. Find the distance of the point (2,3) from the line 2x – 3y + 9 = 0 measured along a line x – y + 1= 0.
9. A box contains two white, three black and four red balls. In how many ways can three balls be drawn from the box, if atleast one black ball is to be included in the draw?
10. Find the term independent of x in the expansion of $\left(x^2 - \frac{2}{x^3}\right)^5$
11. Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of its latus rectum

12. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, – 8) is divided by the YZ-plane

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. Let A and B be sets. If $A \cap X = B \cap X = \varphi$ and $A \cup X = B \cup X$ for some set X, show that A = B.

14. Find the domain and range of the function $f(x) = \frac{4}{1-x^2}$

15. Show that $2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos 2(\alpha+\beta) = \cos 2\alpha$

16. Find the general solution for the following equation: $\sin\theta + \sin 3\theta + \sin 5\theta = 0$

17. Prove by mathematical induction:

Prove that $(1+x)^n \geq (1+nx)$, for all natural number n, where $x > -1$.

OR

Prove that $2.7^n + 3.5^n - 5$ is divisible by 24, for all $n \in N$.

18. Find the square root of the following: $-8 - 6i$

OR

Find real θ such that $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

19. If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

20. Find the equation of the line through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$, that has equal intercepts on the axes.

21. There are 15 points in a plane, of which 6 are collinear. How many i) straight lines ii) triangles can be formed by joining them.

OR

In how many ways can the letters of the word PERMUTATIONS be arranged if the (i) words start with P and end with S, (ii) vowels are all together, (iii) there are always 4 letters between P and S.

22. Find the derivative of $\sqrt{tanx}$ from first principle

23. Find $\lim_{x\to 0} f(x)$ where $f(x) = \begin{cases} \frac{x-|x|}{x}, & if\ x \neq 0 \\ 2, & if\ x = 0 \end{cases}$

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B, 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
    (a) The number of families which buy newspaper A only.
    (b) The number of families which buy newspaper B only
    (b) The number of families which buy none of A, B and C.

25. If $x\cos\theta = y\cos\left(\theta + \frac{2\pi}{3}\right) = z\cos(\theta + \frac{4\pi}{3})$, then find the value of xy + yz + zx.

OR

If α and β are the solutions of the equation a tan θ + b sec θ = c, then show that

$\tan(\alpha + \beta) = \frac{2ac}{a^2 - c^2}$

26. Find the equation of the circle passing through the point (2,-2), (3, 4) and whose centre is on the line 2x + 2y = 7

27. Solve the following system of inequalities graphically:

$x - 2y \leq -1,\ 2x + y \geq 3\ ,\ y < 3,\ x \geq 0\ ,\ y \geq 0$

28. If p, q, r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.

OR

If a is the AM of b and c and the two geometric means are G_1 and G_2, then prove that

$G_1^3 + G_2^3 = 2abc$

29. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6} : 1$.

OR

Show that the coefficient of the middle term in the expansion of $(1 + x)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(1 + x)^{2n-1}$

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