ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI - 110 054
Annual Examination in **MATHEMATICS**

Std. 11 — Time : 3 hrs.
20-2-2018 — Max. Marks : 100

GENERAL INSTRUCTIONS:
- i) All the questions are compulsory.
- ii) Section A contains 4 questions of 1 mark each.
- iii) Section B contains 8 questions of 2 marks each.
- iv) Section C contains 11 questions of 4 marks each.
- v) Section D contains 6 questions of 6 marks each.

SECTION - A

1. If R is set of real number and Q is set of rational numbers, then what is R-Q?

2. If the set A has 3 elements and set B = {3, 4, 5} then find the number of elements in AxB.

3. Find the distance between the points (-2, 3, 5) and (7, 0, -1).

4. Events E and F are such that P(not E or not F) = 0.25. State whether E and F are mutually exclusive?

SECTION – B

5. If A = {1, 2} find A x A x A.

6. Let U = {1, 2, 3, 4, 5, 6}, A = {2, 3} and B = {3, 4, 5} find
   i) $A' \cap B'$ ii) $(A \cup B)'$

7. If three points (h, 0), (a, b), (0, k) lie on line, show that $\frac{a}{h}+\frac{b}{k}=1$

8. Find equation of ellipse whose vertices are (5, 0), (-5, 0) and foci are (4, 0), (-4, 0).

9. A fair coin with 1 marked on one face and 6 on other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is 12.

10. Prove that $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

11. Evaluate : $\underset{x \to 0}{\text{lt}} \frac{\sin x^{0}}{x}$

12. Differentiate $\sin^m x \cos^n x$ w.r.t x

SECTION – C

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

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

15. If a and b are the lengths of perpendiculars from the origin to the line $x\cos\theta - y\sin\theta = k\cos 2\theta$ and $x\sec\theta + y\,\text{cosec}\theta = k$ respectively. Prove that $a^2 + 4b^2 = k^2$.

16. Find the equation of circle passing through the points (2, 3) and (-1, 1) and whose centre lies on line x - 3y - 11 = 0.

17. Find the coordinates of foci, vertices, eccentricity and length of latus rectum of conic $y^2 - 16x^2 = 16$.

18. In ΔABC prove $\frac{b^2-c^2}{a^2}\sin 2A+\frac{c^2-a^2}{b^2}\sin 2B+\frac{a^2-b^2}{c^2}\sin 2C=0$

(OR)

In ΔABC prove that $a^3\sin(B-C)+b^3\sin(C-A)+c^3\sin(A-B)=0$

19. Evaluate : $\lim\limits_{x\to\frac{\pi}{6}}\frac{2-\sqrt{3}\cos x-\sin x}{(6x-\pi)^2}$ (OR) $\lim\limits_{x\to 0}\frac{(2x-3)(\sqrt{x}-1)}{3x^2+3x-6}$

20. If $y=\frac{\sin x-x\cos x}{x\sin x+\cos x}$, Prove $\frac{dy}{dx}=\frac{x^2}{(x\sin x+\cos x)^2}$

21. If for $f(x)=\lambda x^2+\mu x+12, f'(4)=15$ and $f'(2)=11$ then find λ and μ.

22. Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelop.

23. A point R with x-coordinate 4 lies on the line segment joining the points P(2, -3, 4) and Q(8, 0, 10). Find the coordinates of the point R.

SECTION – D

24. Find the derivative of $\sin x^2$ w.r.t x using first principle.

(OR)

Find the derivative of $\cos\sqrt{x}$ w.r.t x using first principle.

25. Solve graphically $x + 2y \le 10$, $x + y \ge 1$, $x - y \le 0$, $x \ge 0$, $y \ge 0$.

26. Find the equation of lines through the point (3, 2) which make an angle of 45^0 with the line x – 2y = 3.

27. A school awarded 58 medals for Honesty, 20 for Punctuality and 25 for Obedience. If these medals were bagged by a total of 78 students and only 5 students got medals for all the three values, find the number of students who received medals for exactly two of three values.

28. An urn contain 9 red, 7 white and 4 black balls. If two balls are drawn at random. Find the probability that

i) Both the balls are red ii) One ball is white

iii) The balls are of same colour iv) One is white and other is red

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

ii) Prove $\cos 20^0\cos 40^0\cos 60^0\cos 80^0 = 1/16$.

(OR)

i) If $\tan A = 1/7$ and $\tan B = 1/3$ show that $\cos 2A = \sin 4B$

ii) Prove $\sin 20^0 \sin 40^0 \sin 60^0 \sin 80^0 = 3/16$.

-x-x-x-x-x-x-