



ST.XAVIER'S SENIOR SECONDARY SCHOOL, JAIPUR
Annual Examination: 2014 – 15

04 – 3 – 2015	STD : XI	MATHEMATICS	TIME : 3 HRS	MARKS : 70
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Instructions:

- All questions are compulsory.
- The question paper consists of three sections i.e. A, B and C. Section A consists of 9 questions of 1 mark each, Section B consists of 12 questions of 3 marks each and Section C consists of 5 questions of 5 marks each.
- There is no overall choice. However, internal choice has been provided in some questions. You have to attempt only one of the choices in such questions.

SECTION – A

- If $R = \{(x, y) : y = x + 2, -1 < x \leq 4, x \in Z\}$, then express R as a set of ordered pairs.
- If $A = \{1, 3, 5\}$, $B = \{1, 2\}$ and $C = \{1, 3\}$, then find $A \cap (B - C)$.
- Find the Domain of the function $f(x) = -\sqrt{-5 - 6x - x^2}$.
- If $\tan \theta = \frac{5}{12}$, $\pi \leq \theta \leq \frac{3\pi}{2}$, find $\cos \theta$.
- Find the radius of the circle in which a central angle of 45° intercepts an arc 132 cm.
- Solve for x, if $|3x| \geq \frac{1}{2}$.
- Find the 6th term in the expansion of $\left(x - \frac{1}{x}\right)^{10}$.
- Find the foci of the hyperbola $16x^2 - y^2 = 16$.
- Find the y-coordinate of the point which divides the joining of the points (2, -1, 3) and (4, 3, 1) in the ratio 3:4 internally.

SECTION - B

10. Prove that: $\cos 2x \cos \frac{x}{2} - \sin 5x \sin \frac{5x}{2} = \cos 3x \cos \frac{9x}{2}$.

OR

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

11. Solve the following equation:

$$\tan^3 \theta + \tan^2 \theta = 3 \tan \theta + 3$$

12. Solve the system of linear inequations graphically: $2x + y \geq 8$; $x + 2y > 10$; $x \geq 0$; $y \geq 0$.

13. A committee of 3 men and 2 women is to be chosen from 7 men and 5 women. Within the 12 people there is a husband and wife. In how many ways can the committee be chosen if it must contain either the wife or the husband but not both?

OR

A car can hold 3 people in the front seat and 4 in the back seat. In how many ways can 7 people be seated in the car if Jane & Shane must sit in the back seat and there is only one driver?

14. Find the term independent of x in the expansion of $\left(2x - \frac{1}{x}\right)^6 \left(\frac{1}{2x} + x\right)^6$.

15. The third and the fifth terms of an A.P. are $x + y$ and $x - y$ respectively. Find the 12th term.

16. Prove that the area of the triangle whose vertices are $(t, t - 2)$, $(t + 2, t + 2)$ and $(t + 3, t)$ is independent of t .
17. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ whose vertex is at the vertex of the parabola. Find the length of its side.
18. 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.
19. If $f(x) = \frac{1}{\sqrt{x}}$, then find the value of $f'(x) + \frac{f(x)}{2x}$.
20. Differentiate: $\frac{\sin x}{1 - \cos x}$

OR

Differentiate: $\frac{x^2 + 1}{x \log x}$

21. A bag has 20 coins numbered from 1 to 20. A coin is drawn at random and its number is noted. What is the probability that the coin has a number that is divisible by 3 or by 5?

OR

A coin is tossed 3 times, Find the probability that-

- i) 2 heads show uppermost
- ii) At least 2 heads show uppermost
- iii) 3 heads or 3 tails show uppermost

SECTION - C

22. How many even numbers are there with three digits such that if 5 is one of the digits, then 7 is the next digit?
23. Three numbers a, b and c, whose sum is 15 are consecutive terms of a G.P. and b, a, c are consecutive terms of A.P. Find the value of a, b and c.

OR

Find the sum of the series $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots$ to 16 terms.

24. Find the distance of the point (2, 5) from the line $3x + y + 4 = 0$, measured parallel to a line having slope $\frac{3}{4}$.

OR

Find the image of the point (3, 8) with respect to the line $x + 3y = 7$, assuming line to be a plane mirror.

25. Evaluate: $\lim_{h \rightarrow 0} \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}} \right)$

26. An urn contains 8 red, 6 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn is-
- i) Black
 - ii) Black and Red
 - iii) Black or Red