

SBOA School & Junior College, Chennai.
Half Yearly Examination 2016 – 2017
Mathematics Code – A

Std: XI
Marks: 100

Time: 3hrs

General Instructions:

1. All questions are compulsory.
2. Question No. 1 to 4 carry one mark each.
3. Question No. 5 to 12 carry two marks each.
4. Question No. 13 to 23 carry four marks each.
5. Question No. 24 to 29 carry six marks each.

Section – A

1. Evaluate: $\text{Lt } \frac{x^3+1}{x+1}$.
2. Find the inclination of the line $x - y + 3 = 0$ with positive direction of x axis.
3. The third term of G.P is 4. Find the product of the first five terms.
4. Find the principal solutions of $\cot x = -\sqrt{3}$.

Section – B

5. Solve: $x^2 + 3x + 5 = 0$.
6. If the points (a, o) (0, b) (3, 4) are collinear. Show that $\frac{3}{a} + \frac{4}{b} = 1$.
7. Find the middle term in the expansion of $(2x + y)^8$.
8. Find the sum to infinity of the sequence $4, \frac{4}{3}, \frac{4}{9}, \dots$
9. How many permutations of the letters of the word 'APPLE' are there?
10. Prove that: $\cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2} \cos x$.
11. Find the sum of the series:
 $5^3 + 6^3 + 7^3 + \dots + 20^3$.
12. Find the equation of Parabola with vertex (0, 0), Passing through the point (2, 3) and axis along $x - axis$.

Section – C

13. In a locality of 500 people, people speak Bengali or Urdu or both, 270 speak Bengali only, 75 speak both Bengali and Urdu. How many of them speak Urdu? Also find how many speak Urdu only.
14. Find the domain and range of the real function $f(x) = \sqrt{121 - x^2}$.
15. Solve: $\sec^2 2x = 1 - \tan 2x$.
16. Find the square root of a complex number $9 + 40i$.

(or)

Solve for x and y : $(1 + i)y^2 + (6 + i) = (2 + i)x$.

17. Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an A.P. and the ratio of 7th and $(m - 1)^{\text{th}}$ numbers is 5:9. Find the value of m .

(or)

Sum of the first p , q , r term of an A.P. are a , b , c respectively.

Prove that $\frac{a}{p}(q - r) + \frac{b}{q}(r - p) + \frac{c}{r}(p - q) = 0$.

18. Find the equation of a circle which passes through the point $(1, 3)$ and $(2, -1)$ and has its centre on the line $2x + y - 4 = 0$.

19. A group consists of 9 boys and 6 girls. In how many ways can a team of 7 members be selected if the team has (i) no girl, (ii) atleast 1 boy and 1 girl.

20. Evaluate: $\text{Lt } \frac{\cos 5x - \cos 3x}{x^2}$.

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

(or)

Find the equation of the line which passes through the point $(3, 4)$ and cut off intercepts from the co-ordinate *axes* such that their sum is 14.

22. Find the derivative of $f(x) = \frac{2x+3}{x-2}$ from the first principle.

23. Solve the following system of in equations graphically.

$$3x + 4y \leq 12, 4x + 3y \leq 12, x \geq 0, y \geq 0.$$

Section - D

24. Prove that $\frac{\cos 4x \sin 3x - \cos 2x \sin x}{\sin 4x \sin x + \cos 6x \cos x} = \tan 2x$.

(or)

Evaluate $\sin 10^\circ \cdot \sin 30^\circ \cdot \sin 50^\circ \cdot \sin 70^\circ$.

25. In the expansion of $(1 + x)^n$ the three successive coefficient are 462, 330 and 165 respectively. Find the values of n and r .

26. Show that $\frac{1x2^2+2x3^2+,.....+n(n+1)}{1^2x2+2^2x3+\dots+n^2(n+1)} = \frac{3n+5}{3n+1}$.

27. Differentiate the following functions with respect to x .

(i) $\frac{x^2+5x-6}{4x^2-x+3}$ (ii) $\cos x \sin x$

(or)

(i) $x^4(5\sin x - 3\cos x)$ (ii) $\frac{4x+5\sin x}{3x+7\cos x}$.

28. Using Principle of Mathematical Induction for all $n \in \mathbb{N}$. Prove that:

$$\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}$$

29. Find the lengths of the *axes*, the co-ordinate of the vertices and the foci, the eccentricity and length of the latus rectum of the hyperbola.

$$25x^2 - 9y^2 = 225.$$

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Section – A

1. Evaluate: $\text{Lt } \frac{x^3-1}{x-1}$.
2. Find the Principal solutions of $\text{cosec } x = -2$.
3. Is -500 term of the sequence $-3, -7, -11, -15, \dots$?
4. Find the inclination of the line $x + \sqrt{3}y - 6 = 0$ with the positive direction of x axis.

Section – B

5. Solve: $x^2 - x + 2 = 0$.
6. Find the value of P for which the following lines are perpendicular
 $Px + 3y = 4; 3x - 4y = 7$.
7. Find the middle term in the expansion of $(2x - y)^8$.
8. In an examination a candidate has to pass in each of the 5 subjects. In how many ways can he fail?
9. Find the sum to infinity of the sequence $7, -1, 1/7, \dots$.
10. Prove that: $\frac{\cos(\pi+x) \cos(-x)}{\sin(\pi-x) \cos(\pi/2+x)} = \cot^2 x$.
11. Find the sum of the series: $5^2 + 6^2 + 7^2 + \dots + 20^2$.
12. Find the equation of Parabola whose vertex $(0, 0)$ passing through the point $(5, 2)$ and axis along $y - axis$.

Section – C

13. In a group of 950 persons, 750 can speak Hindi, 460 can speak English. Find how many can speak both Hindi and English. How many can speak English only.
14. Solve: $\sin 2x - \sin 4x + \sin 6x = 0$.
15. Find the domain and range of the real function $f(x) = \sqrt{225 - x^2}$.
16. Find the square root of a complex no. $7 + 24i$.

(or)

Solve for x and y : $(x - iy)(2 + 3i) = \frac{x+2i}{1-i}$

17. Find the number of arrangements of the letter of the word 'INDEPENDENCE'. In how many of these arrangements do all the vowels never occur together.

18. The sum of first 3 terms of a G.P is 16 and the sum of next three terms is 128.
Determine first term, common ratio, and sum of n terms of a G.P

(or)

If the p^{th}, q^{th}, r^{th} terms of a G.P are a, b, c respectively.

Prove that $a^{q-r} b^{r-p} c^{p-q} = 1$.

19. Evaluate: $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{x - \frac{\pi}{4}}$.

20. Find the derivative of $f(x) = \sin(x + 1)$ from first Principle.

21. Find the image of the point $P(-8, 12)$ with respect of line $4x + 7y + 13 = 0$ assuming the line to be a plane mirror.

(or)

Find the equations of the line through the point of Intersection of the lines $x - 5y - 7 = 0$ and $2x + 3y - 4 = 0$ and that has its x intercept equal to - 4.

22. Solve the following system of inequalities graphically.

$$x + y \leq 20, x + 3y \leq 30, x \geq 0, y \geq 0.$$

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

Section – D

24. Prove that: $\frac{\cos 2x \sin x + \cos 6x \sin 3x}{\sin 2x \sin x + \sin 6x \sin 3x} = \cot 5x$.

(or)

Prove that: $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 60^\circ \cdot \cos 80^\circ = \frac{1}{16}$.

25. Using the Principle of mathematical induction for $n \in \mathbb{N}$. Prove that:

$$\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \dots + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}$$

26. The first 3 terms in the binomial expansion of $(x + y)^n$ are 1, 56, 1372 respectively. Find the values of x and y .

27. Differentiate the following functions with respect to x .

(i) $\sin x \tan x$ (ii) $\frac{x^2 + 3x - 1}{x + 2}$

(or)

(i) $(x + \sec x)(x - \tan x)$ (ii) $\frac{6x + 4\sin x}{5x + 9\cos x}$

28. Find the sum of the following series up to n terms:

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1 + 3} + \frac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + \dots$$

29. Find the lengths of the major and minor axes, co-ordinates of the vertices, and the foci, the eccentricity and length of the latus rectum of the ellipse

$$16x^2 + 25y^2 = 400.$$
