

Time Allowed:-3Hrs.

Max. Marks: - 100

General Instruction:

- I. All questions are compulsory.
- II. The question paper consists of 29 questions divided into three sections A, B, C and D. Section A comprises of 4 questions of one mark each, Section B comprises of 8 questions of two marks each, Section C comprises of 11 questions of four marks each and Section D comprises of 6 questions of six marks each.
- III. All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.

Section A (1X6)

- Q1. For what value of k numbers $-\frac{3}{7}$, k, $-\frac{7}{3}$ are in G.P .
- Q2. Write the compound statement by using connectives 'or' for the statements
p: 25 is multiple of 5 q: 25 is multiple of 8
- Q3. Let A = {1,2} and B = {3,4}. How many subsets will A X B have?
- Q4. Find the slope of the line $3x+2=0$

Section B (2X8)

- Q5. Write the power set of set A = {a, b, c}
- Q6. Write the contra positive and converse of the statement:
If you are born in India, then you are a citizen of India.
- Q7. Find the value of $\tan \frac{\pi}{8}$.
- Q8. Evaluate : $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x^2}$
- Q9. Given that A (3,2,-4), B (5,4,-6) and C (9,8,-10) are collinear. Find the ratio in which B divides AC.
- Q10. If p is length of perpendicular drawn from origin to the line whose intercepts on the axes are a and b, then show that
- $$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$
- Q11. Find the number of different 8 letters arrangements that can be made from the letters of the word 'DAUGHTER' so that all consonants occur together .

Q12. In a relay race there are 5 teams A,B,C,D & E . What is the probability that A, B , C finish first , second and third , respectively.

Section C (4X11)

Q13. Convert the complex number $\frac{(1+7i)}{(2-i)^2}$ in polar form.
OR

Reduce the complex number in standard form a+ib

$$\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$$

Q14. Solve the following system of inequalities graphically
 $4x+3y \leq 60, \quad y \geq 2x, \quad x \geq 3$

Q15. Prove that: $\cos^2\left(x+\frac{\pi}{3}\right) + \cos^2\left(x-\frac{\pi}{3}\right) - \sin^2 x = \frac{1}{2}$

Q16. Find $(a+b)^4 - (a-b)^4$, hence evaluate $(\sqrt{5}+\sqrt{2})^4 - (\sqrt{5} - \sqrt{2})^4$.

Q17. Find the coordinates of foci, vertices, eccentricity and length of latus rectum of hyperbola $49y^2 - 16x^2 = 784$

Q18. Solve : $\sin 2x + \sin 4x + \sin 6x = 0$

Q19. If $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is the arithmetic mean of a and b, then find the value of n.

OR

If A.M. and G.M. of two positive numbers a& b are 17 and 15 respectively, find the numbers.

Q20. Find the domain and the range of real function $f(x) = \sqrt{16-x^2}$.
OR

If $A = \{0,1,2,3,4,5\}$ and define relation R from A to A,
 $R = \{(x,y) : x+y > 5 : x,y \in A\}$. Write R in roster form also domain and range.

Q21. Find the derivative by first principle of $f(x) = \frac{x-2}{x+2}$

Q22. A committee of 7 has to be formed from 8 men and 4 women for "Swachhhta Abhiyan". What is the probability that the committee consists of

(i) exactly 3 women

(ii) at least 3 women

What is the role of students in Swachhhta Abhiyan.

Q23. Find the co-ordinates of the foot of perpendicular from the point (1,0) to the line $3x-4y-16=0$

Section D (6X6)

Q24. Prove by using the principle of mathematical induction for all $n \in \mathbb{N}$,

$$1.3 + 3.5 + 5.7 + \dots + (2n-1)(2n+1) = \frac{n(4n^2 + 6n - 1)}{3}$$

Q25. In ΔABC , prove that

$$\frac{b^2 - c^2}{a^2} \sin 2A + \frac{c^2 - a^2}{b^2} \sin 2B + \frac{a^2 - b^2}{c^2} \sin 2C = 0$$

OR

In ΔABC , prove that

$$(b^2 - c^2) \cot A + (c^2 - a^2) \cot B + (a^2 - b^2) \cot C = 0$$

Q26. If a, b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$ where a, b, c, d are in G.P. Prove that $(q + p) : (q - p) = 17 : 15$

OR

Find the sum of series upto n terms

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

Q27. Find the mean, variance and standard deviation for following data

Marks	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. Of students	3	7	12	15	8	3	2

Q28. Find the no. of ways in which a hand of 7 cards is drawn from a well shuffled deck of 52 cards such that it contains

(i) all queens ; (ii) 3 kings ; (iii) at least 3 aces.

Q29. In a survey of 80 people it was found that 25 people read Dainik Jagran, 26 read Amar Ujala and 26 read Hindustan 9 read both Dainik Jagran & Amar Ujala 11 read Amar Ujala and Hindustan and 8 read Hindustan and Dainik

Jagan 3 read all three newspapers find how many read

- (i) none of them .
- (ii) at least one newspapers .
- (iii) exactly one news paper

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FINAL EXAMINATION
MATHEMATICS
CLASS – XI
MARKING SCHEME

1. $k = \pm 1$	1
2. 25 is multiple of 5 or 8	1
3. $2^4=16$	1
4. slope is not defined	1
5. $P(A) = \{ \emptyset, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}, \{a,b,c\} \}$	2
6. Contrapositive: If you are not a citizen of India then you are not born in India Converse: If you are a citizen of India then you are born in India.	1+1
7. Applying identity of $\tan 2x$ and getting $1 = \frac{2y}{1-y^2}$ $y = \pm(\sqrt{2} - 1)$ than $\tan \frac{\pi}{8} = \sqrt{2} - 1$	1/2 1/2 1/2 1/2
8. $\lim_{h \rightarrow 0} \frac{-2\sin^2 x/2}{x^2}$ $= -1/2$	1 1
9. $(\frac{9k+3}{k+1} , \frac{8k+2}{k+1} , \frac{-10k+ -4}{k+1})$ For comparing coordinate $k = 1/2$ For ratio $k : 1 = 1 : 2$ (internally)	1 1/2 1/2
Equation of line $\frac{x}{a} + \frac{y}{b} = 1$	1/2 1

<p>length of perpendicular p = $\frac{1}{\sqrt{\frac{1}{a^2} + \frac{1}{b^2}}}$</p> $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$	1/2
<p>11. total no. of words = 8! 4! x 5! = 2880</p>	1 1
<p>12. Total Outcomes = 5*4*3 = 60 Probability = 1/60</p>	1 1
<p>13. Expressing Z = -1 + i r = $\sqrt{2}$ and $\theta = \frac{3\pi}{4}$</p> $z = \sqrt{2} \left(\cos\left(\frac{3\pi}{4}\right) + i \sin\left(\frac{3\pi}{4}\right) \right)$ <p style="text-align: center;">or</p> $\left(\frac{1}{1-4i} - \frac{2}{1+i} \right) \left(\frac{3-4i}{5+i} \right)$ $= \left(\frac{-1+9i}{5-3i} \right) \left(\frac{3-4i}{5+i} \right)$ $= \left(\frac{307}{442} \right) + \left(\frac{599}{442} \right) i$	1 1 1 1 2 2
<p>14. For each correct graph (1X3) and for correct shading</p>	3 1
<p>15. $\frac{1}{2}(-2\sin^2 x + 2\cos^2(x + \frac{\pi}{3}) + 2\cos^2(x - \frac{\pi}{3}))$</p> $= \frac{1}{2} [1 + (\cos 2x + \cos(2x + 2\frac{\pi}{3})) + \cos(2x - 2\frac{\pi}{3})]$ $= \frac{1}{2} [1 + \cos 2x + 2\cos 2\frac{\pi}{3} \cos 2x]$ $= 1/2$	1 1 1 1
<p>16. $(a+b)^4 - (a-b)^4$ $= 2({}^4C_1 a^3 b + {}^4C_3 a b^3)$ $= 8ab(a^2 + b^2)$ $(\sqrt{5} + \sqrt{2})^4 - (\sqrt{5} - \sqrt{2})^4 = 56\sqrt{10}$</p>	2 1 1
<p>17. a = 4, b = 7, c = $\sqrt{65}$ foci = $(0, \pm\sqrt{65})$ vertices = $(0, \pm 4)$ $e = \frac{\sqrt{65}}{4}$ LR = 49/2</p>	$\frac{1}{2}$ 1 1 1 $\frac{1}{2}$
<p>18. For reducing the equation in form and for factorizing $\sin 4x(1 + 2\cos 2x) = 0$</p>	2 1+1

For general solution $x = n\pi/4, n \in \mathbb{Z}$ or $x = n\pi \pm \frac{\pi}{3}$	
19. $\frac{a^n + b^n}{a^{n-1} + b^{n-1}} = \frac{a+b}{2}$ for cross multiplication separating a and b for getting n = 1 or $\frac{a+b}{2} = 17$ $\sqrt{ab} = 15$ for solving for getting a = 25, and b = 9	1 1 1 1 1 1 1 1
20. Domain = [-4, 4] Range = [0, 4] or For writing correct relation Domain = {1, 2, 3, 4, 5} Range = {1, 2, 3, 4, 5}	2 2 2 1 1
21. a) $f'(x) = \lim_{h \rightarrow 0} \frac{(x+h-2)/(x+h+2) - (x-2)/(x+2)}{h}$ Correct calculation $= 4/(x+2)^2$	1 1 2
22. Total Outcomes = ${}^{12}C_7$ i) Probability of 3 W & 4 M = ${}^4C_3 \times {}^8C_4 / {}^{12}C_7$ ii) 3W & 4 M = ${}^4C_3 \times {}^8C_4 = 280$ 4W & 3 M = ${}^4C_4 \times {}^8C_3 = 56$ Total Probability = $336 / {}^{12}C_7$ For values	1 2 1
23. Equation of perpendicular line $4x+3y+k = 0$ $k = -4$ $4x+3y-4 = 0$ for getting point of intersection of perpendicular lines i.e. foot of perpendicular (64/25, - 52/25)	1 $\frac{1}{2}$ $\frac{1}{2}$ 2
24. For n = 1 For n = k For solving n = k + 1 For writing final statement for $n \in \mathbb{N}$	1 1 $\frac{1}{2}$ 3 $\frac{1}{2}$
25. for using $\sin 2A = 2\sin A \cos A$ for using sine rule for using cosine rule For getting correct answer or converting cotA, cot B and cot C in term of sine & cosine using cosine rule solving and getting correct answer	1 $\frac{1}{2}$ 1 $\frac{1}{2}$ 1 $\frac{1}{2}$ 1 $\frac{1}{2}$ 2 2 2

<p>26. $a + b = 3, \quad ab = p$ $c + d = 12, \quad cd = q$ a, b, c, d are in GP $a + ar = 3, \quad ar^2 + ar^3 = 12$ getting $r = \pm 2$ getting $q / p = 16$ applying Componendo and Dividendo $(q + p) / (q - p) = 17/15$ or</p> $T_n = \frac{(n+1)^2}{4}$ $S_n = \sum T_n = \sum \frac{(n+1)^2}{4} = \frac{n(2n^2 + 9n + 13)}{24}$	<p>2 1 2 1 3 1 2</p>
<p>27. $\sum f_i = 50$ $\sum f_i x_i = 3100$ $\sum f_i (x_i - \bar{x})^2 = 10050$ $\bar{x} = 62$ $V = 201$ $SD = 14.18$</p>	<p>$\frac{1}{2}$ 1 2 1 1 $\frac{1}{2}$</p>
<p>28. (i) ${}^4C_4 X^{48} {}^4C_3$ (ii) ${}^4C_3 X^{48} {}^4C_4$ (iii) ${}^4C_4 X^{48} {}^4C_3 + {}^4C_3 X^{48} {}^4C_4$</p>	<p>2 2 2</p>
<p>29. For correct Venn diagram (i) none of them = 28 (ii) at least one newspaper = 52 (iii) exactly one newspaper = 30</p>	<p>$1 \frac{1}{2}$ $1 \frac{1}{2}$ $1 \frac{1}{2}$ $1 \frac{1}{2}$</p>