TEST PAPER – 13 (Govt. School Spl.)

Mathematics – XI

Time : 3 hr **Max Marks : 100**

General Instructions :

1. All questions are compulsory.

2. The question paper consists of **29 questions** divided into three sections **A, B** and **C. Section A** comprises of **10** questions of **one mark** each, **Section B** comprises of **12** questions of **four marks** each and **Section C** comprises of **07** questions of **six marks** each.

3. All questions in **Section A** are to be answered in one word, one sentence or as per the exact requirement of the question.

4. There is no overall choice. However, internal choice has been provided in **04** questions of **four marks** each and **02** questions of **six marks** each. You have to attempt only one of the alternatives in all such questions.

5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION – A

(1) Test the validity of the assignment of probabilities **{ 0.1, 0.2, 0.3, 0.4, 0.3, – 0.2, – 0.1 }.**

(2) If**, A = {1, 2, {3, 4}}** be any set**,** then find the all subsets of the set **A.**

(3) Find the domain and range of the function $f(x) = \sqrt{4 - x^2}$

(4) Let f be the subset of **Z** × **Z** *defined by* $f = \{(ab, a + b) : a, b \in Z\}$**.** Is '***f***' a function from **Z** to **Z** ? Justify your answer.

(5) Find the radius of the circle in which a central angle of **60°** intercepts an arc of length **37.4 cm.**

(6) Find the value of **:** $\sin\left(\frac{5\pi}{12}\right)$

(7) Find the conjugate of the complex number $\frac{(3 - 2i)(2 + 3i)}{(1 + 2i)(2 - i)}$

(8) Find the least non negative integral value of 'm' if $\left(\frac{1 + i}{1 - i}\right)^m = 1$

(9) Find the component statements of the statement**: 24** is a multiple of **2, 4** and **8.**

(10) Write the negation of the statement : There are **35** days in a month.

P.T.O

SECTION – B

(11) In a survey of **60** people**,** it was found that **25** people read newspaper **H, 26** read newspaper **T, 26** read newspaper **I, 9** read both **H** and **I, 11** read both **H** and **T, 8** read both **T** and **I, 3** read all three newspapers**.** Find the number of people who read exactly one newspaper**.**

(12) Prove that **:** $\sin\frac{\pi}{14}\ \sin\frac{3\pi}{14}\ \sin\frac{5\pi}{14} = \frac{1}{8}$

OR

Prove that **:** $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+2\cos 16\theta}}}} = 2\cos\theta$

(13) Solve for **'*x*' :** $x^2 - (5 + i)\,x + (18 - i) = 0$**.**

(14) Using principle of mathematical induction prove that,

for all $n \geq 1$, $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \text{- - -} + n$ **terms** $= \frac{n\,(n+1)^2(n+2)}{12}$

(15) How many litres of water will have to be added to **1125** litres of the **45%** solution of acid so that the resulting mixture will contain more than **25%** but less than **30%** acid content **?**

(16) Find the number of words with or without meaning which can be made using all the letters of the word **AGAIN.** If these words are written as in a dictionary**,** what will be the **50th** word**?**

OR

In how many ways can the letters of the word **PERMUTATIONS** be arranged if the
(i) vowels are all together,
(ii) there are always **4** letters between **P** and **S ?**

(17) Let **S** be the sum**, P** the product and **R** the sum of reciprocals of n terms in a **G.P.** Prove that $P^2 R^n = S^n$**.**

OR

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 d/p , e/q , f/r are in **A.P**

(18) A rod **AB = 15 cm** lies in between coordinate axes in such a way **A** always lies on ***x – a*xis** and **B** on ***y – a*xis .** Prove that locus of a point on the rod which divides **AB** in the ratio **3 : 2.**

(19) Find the equation of the circle whose centre is **(3 , –1)** and which cut off an intercept of length **6** from the line **2x – 5y + 18 = 0.**

OR

Find the coordinates of **foci** and **vertices, the eccentricity** and the length of **latus rectum** of the hyperbola $9y^2 - 4x^2 = 36$ **.**

(20) 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.**

(21) Calculate the mean deviation about median age for the age distribution of **100** persons given below**:**

Age	**16 – 20**	**21 – 25**	**26 – 30**	**31 – 35**	**36 – 40**	**41 – 45**	**46 – 50**	**51 – 55**
Number	**5**	**6**	**12**	**14**	**26**	**12**	**16**	**9**

(22) Find the probability that when a hand of **7** cards is drawn from a well shuffled deck of **52** cards it contains at least **3** kings.

SECTION – C

(23) Find the value of **'*a*',** so that $\lim_{x \to 0} f(x) = f(0)$, for the function

$$f(x) = \begin{cases} a \sin \dfrac{\pi(x+1)}{2} & ; x \leq 0, \\ \dfrac{\tan x - \sin x}{x^3} & ; x > 0 \end{cases}$$

OR

Evaluate **(i)** $\lim_{x \to 0} \left\{ \dfrac{2 \sin x - \sin 2x}{x^3} \right\}$

(ii) $\lim_{x \to 0} \left\{ \dfrac{(a+x)^2 \sin(a+x) - a^2 \sin a}{x} \right\}$

(24) Using ab – initio find the derivative of the function $f(x) = x \sin x$

(25) A ray of light is sent along the line $x - 2y = 3$. Upon reaching the line $3x - 2y = 5$, the ray is reflected from it. Find the equation of the line containing the reflected ray.

OR

Find the equation of the straight line passing through the point **(–2 , –7)** and having an intercept of length **3** between the straight lines $4x + 3y = 12$ and $4x + 3y = 3$.

(26) Show that : $\dfrac{1 \times 2^2 + 2 \times 3^2 + - - - + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + - - - + n^2 \times (n+1)} = \dfrac{3n+5}{3n+1}$.

(27) The mean and standard deviation of **20** observations are found to be **10** and **2,** respectively**.** On rechecking**,** it was found that an observation **8** was incorrect**.** Calculate the correct mean and standard deviation if the wrong item is replaced by **12.**

(28) Prove that $\cos^2 \dfrac{\pi}{8} + \cos^2 \dfrac{3\pi}{8} + \cos^2 \dfrac{5\pi}{8} + \cos^2 \dfrac{7\pi}{8} = 2$

(29) The second, third and fourth terms in the binomial expansion $(x + a)^n$ are **240, 720** and **1080,** respectively. Find **'*x*', '*a*'** and **'*n*'.**

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