TEST PAPER – 1 (D.P.S Special)

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) Write the set **A = { – 2, –1, 1 }** in set builder form.

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

(3) Find the equation of the parabola with vertex **(0, 0)** passing through **(2, 3)** and symmetric with respect to ***x – axis***.

(4) Find the equation of the set of points which are equidistant from the points **(1, 2, 3)** and **(3, 2, –1).**

(5) In the statement ***p : To enter a country, you need a passport or a voter registration card.*** Determine whether an inclusive **"Or"** or exclusive **"Or"** is used. Give reasons for your answer.

(6) Find the value of the complex number $i^{n} + i^{n+1} + i^{n+2} + i^{n+3}$.

(7) If a polygon has **27** diagonals, find the number of sides it can has**.**

(8) If **A** and **B** are events such that **P(A) = 0.42, P(B) = 0.48** and **P(A or B) = 0.74.** Determine **P(A** but not **B).**

(9) If $y = \tan x°$, find $\dfrac{dy}{dx}$

(10) Evaluate : $\lim_{x \to 1} \left\{\dfrac{x^2 - \sqrt{x}}{\sqrt{x} - 1}\right\}$

P.T.O

SECTION – B

(11) A college awarded **38** medals in football**, 15** in basketball and **20** in cricket. If these medals went to a total of **58** men and only three men got medals in all the three sports**,** how many received medals in exactly two of the three sports **?**

(12) Let **R** be a relation on **Z** defined by **R = {(x, y) : | x – y |** is divisible by **n ; x, y, n ∈ Z }.**
Are the following true?
(i) (x, x) ∈ R, for all **x∈N** **(ii) (x, y) ∈ R, ⇒ (y, x) ∈ R** **(iii) (x, y) ∈ R, (y, z) ∈ R ⇒ (x, z) ∈ R.**

(13) Show that **:** $\dfrac{\sec 8x - 1}{\sec 4x - 1} = \dfrac{\tan 8x}{\tan 2x}$ **OR** Prove that **:** $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 16\theta}}}} = 2\cos\theta$

(14) Let $x = 1 + a + a^2 + - - -$ and $y = 1 + b + b^2 + - - -$ where $|a| < 1$ and $|b| < 1$
Prove that $1 + ab + a^2b^2 + - - - = \dfrac{xy}{x + y - 1}$

(15) Using principle of mathematical induction prove that,
For all **n ≥ 1 ,** $\dfrac{1}{1.2.3} + \dfrac{1}{2.3.4} + \dfrac{1}{3.4.5} + - - - + \dfrac{1}{n(n+1)(n+2)} = \dfrac{n(n+3)}{4(n+1)(n+2)}$

(16) Find the value of **'*a*'** and **'*b*',** so that $\lim_{x \to 1} f(x) = f(1)$, for the function

$$f(x) = \begin{cases} 5ax - 2b & ; x < 1 \\ 11 & ; x = 1 \\ 3ax + b & ; x > 1 \end{cases}$$

(17) If **4**-digit numbers greater than **5,000** are randomly formed from the digits **0, 1, 3, 5,** and **7,** what is the probability of forming a number divisible by **5** when,
(i) the digits are repeated **?** **(ii)** the repetition of digits is not allowed **?**

OR

If **'A' , 'B'** and **'C'** are any three events associated with any random experiment, then prove that, **P(A∪B∪C) = P(A) + P(B) + P(C) – P(A∩B) – P(B∩C) – P(C∩A) + P(A∩B∩C).**

(18) Find the equation of the hyperbola having foci on $(0\ ,\ \pm\sqrt{10})$ and which passes through **(2 , 3).**

(19) 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.

(20) The mean and variance of eight observations are **9** and **9.25,** respectively**.** If six of the observations are **6, 7, 10, 12, 12** and **13,** find the remaining two observations**.**

(21) Find the equation of the line through the point **(3 , 2)** and which makes an angle 45^o with **x – 2y = 3.**

OR

Assuming that straight lines work as the plane mirror for a point, find the image of the point **(1, 2)** in the line **x – 3y + 4 = 0.**

(22) Find ***n***, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(2^{1/4} + 3^{-1/4}\right)^n$ is $\sqrt{6} : 1$ **.**

OR

Show that the middle term in the expansion of $(1 + x)^{2n}$ is $\dfrac{1.3.5.7.- - -.(2n-1)2^n.\ x^n}{n!}$ **; n ∈ Z₊ .**

SECTION – C

(23) In a triangle **ABC** prove that **:** $(b^2 - c^2)\cot A + (c^2 - a^2)\cot B + (a^2 - b^2)\cot C = 0$

OR

Solve for **'x'** : **tan x + tan (x + π / 3) + tan (x + 2π/ 3) = 3**

(24) Using first principle, find the derivative of the function $f(x) = \sqrt{\tan x}$

(25) Solve the following inequations graphically**:**

2x + y ≤ 12 , 4x + 5y > 20 , x + 2y ≤ 12 , x ≥ 0 , y ≥ 0

(26) A line is such that its segment between the lines **5x – y + 4 = 0** and **3x + 4y – 4 = 0** is bisected at the point **(1, 5).** Obtain its equation**.**

(27) Prove that : $\tan\frac{\pi}{24} = \sqrt{6} - \sqrt{3} - \sqrt{4} + \sqrt{2}$

(28) If a and 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 form a **G.P.** Prove that $(q + p) : (q - p) = 17:15$.

OR

Show that **:** $\dfrac{1 \times 2^2 + 2 \times 3^2 + 3 \times 4^2 + --- + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + --- + n^2 \times (n+1)} = \dfrac{3n+5}{3n+1}$

(29) Using short – cut method calculate mean, variance and standard deviation for the following distribution.

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

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