TEST PAPER – 11 (G. H. P. S. 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) Draw the graph of the function $f(x) = 2x - x^2$.

(2) If, **A = {1, 2, {3, 4}}** be any set, then is **{2, 3} ⊂ A** a true statement? Justify your answer.

(3) If **A = {1, 2}.** Find **A × A × A.**

(4) Find the general solution of the equation $\cos 4x = \cos 2x$

(5) The minute hand of a watch is **1.5** ***cm*** long. How far does its tip move in **40 minutes?**

(6) Solve the equation: $x^3 - 1 = 0$

(7) Find the value **'*a*'** and **'*b*'** if $\frac{(3 + i\sqrt{5})(3 - i\sqrt{5})}{(\sqrt{3} + i\sqrt{2}) - (\sqrt{3} - i\sqrt{2})} = a + ib$

(8) If **A** and **B** are two events such that **P(A) = 0.54, P(B) = 0.69** and **P(A ∩ B) = 0.35.** Find **P(only A)**

(9) In an A.P. if m^{th} term is n and the n^{th} term is m, where $m \neq n$, find the p^{th} term.

(10) Line through the points **(–2, 6)** and **(4, 8)** is perpendicular to the line through the points **(8, 12)** and **(*x*, 24).** Find the value of ***x*.**

P.T.O

SECTION – B

(11) A college warded **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 ?

OR

Using properties of sets, show that**, (i) A ∩ (A ∪ B) = A (ii) A ∪ (A ∩ B) = A.**

(12) Find the value of $\tan\left(\frac{\pi}{8}\right)$

OR

Prove that $\cos^2 x + \cos^2\left\{x + \frac{\pi}{3}\right\} + \cos^2\left\{x - \frac{\pi}{3}\right\} = \frac{3}{2}$

(13) Using Principle of Mathematical Induction prove that **:**

for all $n \geq 1$, $\cos x + \cos 2x + \cos 3x + - - - + \cos nx = \sin\left(\frac{nx}{2}\right).\operatorname{cosec}\left(\frac{x}{2}\right).\cos\left(\frac{(n+1)\,x}{2}\right)$

(14) Find the number of different 8-letter arrangements that can be made from the letters of the word **DAUGHTER** so that**, (i)** all vowels occur together**.**

(ii) Respective position of vowel and consonant remains unchanged**.**

(15) If $|v| = 1$, and $v = \frac{1 - zi}{z - i}$ then prove that z is purely real complex number**.**

(16) Solve the inequation graphically: $x + 2y \leq 10$, $x + y \geq 1$, $x - y < 0$, $x \geq 0$, $y \geq 0$

(17) Find the sum up to n terms of the series **: 0.6 + 0. 66 + 0. 666+…**

(18) Find the equation of the hyperbola having foci on **(0 , ± √10)** and which passes through **(2 , 3).**

OR

Find the equation of the ellipse, such that major axis is **x – axis,** centre is at origin and the ellipse passes through **(4 , 3) and (6 , 2).**

(19) Find the equation of the circle passing through the points **(2, 3)** and **(–1, 1)** and whose centre is on the line $x - 3y - 11 = 0$**.**

(20) Find the coordinates of the point where the line through **(3, – 4, – 5)** and **(2, – 3, 1)** crosses the plane **2x + y + z = 7 .**

(21) Prove that **: cot 2*x* cot 3*x* – cot 3*x* cot 5*x* – cot 5*x* cot 2*x* = 1**

(22) 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).**

OR

Out of **100** students**,** two sections of **40** and **60** are formed**.** If you and your friend are among the **100** students, what is the probability that **(a)** you both enter the same section **?**

(b) you both enter the different sections **?**\

SECTION – C

(23) In **Δ ABC,** Prove that **:** $\cos^2(A/2) + \cos^2(B/2) + \cos^2(C/2) = 2 + 2\sin(A/2).\sin(B/2).\sin(C/2)$

OR

Show that **:** $\left[1 + \cos(\pi/8)\right]\left[1 + \cos(3\pi/8)\right]\left[1 + \cos(5\pi/8)\right]\left[1 + \cos(7\pi/8)\right] = 1/8.$

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

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

(25) Using first principle**,** find the derivative of the function $f(x) = \dfrac{\sin x}{x}$

OR

Using first principle**,** find the derivative of the function $f(x) = \sqrt{x} + \dfrac{1}{\sqrt{x}}$

(26) Find the direction in which a line must be drawn through the point **(–1 , 2)** so that its point of intersection with the line $x + y = 4$ may be at a distance **3 units** from this point **.**

(27) Find the sum of the series up to ***n*** terms **:** $1^3 + \dfrac{1^3 + 2^3}{1 + 3} + \dfrac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + \text{- - -}$

(28) The first, second and third terms in the binomial expansion $(a + b)^n$ are **729, 7290** and **30375** respectively. Find **'*a*', '*b*'** and **'*n*'.**

(29) The diameters of circles (in mm) drawn in a design are given below **:**

Diameters	**33 – 36**	**37 – 40**	**41 – 44**	**45 – 48**	**49 – 52**
No. of circles	**15**	**17**	**21**	**22**	**25**

Using short cut method calculate mean, variance and standard deviation for the distribution

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