V11M

Virudhunagar District
Common Quarterly Examination - 2024

Standard 11
MATHEMATICS

Time: 3.00 Hours Marks: 90

PART - A

I. Choose the best answer: 20x1=20

1) If A = {(x,y); y=sin x, x∈R} and B={(x,y);y=cos x, x∈R} then A∩B contains
   a) no element b) infinitely many elements
   c) only one element d) cannot be determined

2) The number of relations on a set containing 3 elements is
   a) 9 b) 81 c) 512 d) 1024

3) Let X = {1,2,3,4}; y={a, b, c, d} and f={(1,a) (4, b), (2, c) (3, d) (2, d)}. Then f is .....
   a) an one to one function b) an onto function
   c) a function which is not one-to-one d) not a function

4) If $\frac{|x-2|}{x-2} \geq 0$ then x belongs to .....
   a) [2,∞) b) (2,∞) c) (−∞, 2) d) (−2, ∞)

5) If a and b are the real roots of the equation $x^2 - kx + c = 0$ then the distance between the points (a, 0) and (b, 0) is .....
   a) $\sqrt{4k^2 - c}$ b) $\sqrt{k^2 - 4c}$ c) $\sqrt{4c - k^2}$ d) $\sqrt{k - 8c}$

6) The value of $\log_3^{11} . \log_{11}^{13} . \log_{13}^{15} . \log_{15}^{27} . \log_{27}^{81}$ = ...
   a) 1 b) 2 c) 3 d) 4

7) The maximum value of $4\sin^2 x + 3\cos^2 x + \sin\frac{x}{2} + \cos\frac{x}{2}$ is
   a) $4+\sqrt{2}$ b) $3+\sqrt{2}$ c) 4 d) 9

8) If $f(\theta) = |\sin\theta| + |\cos\theta|, \theta \in R$ then $f(\theta)$ is in the interval .....
   a) $[1, \sqrt{2}]$ b) [0,1] c) [0,2] d) [1,2]

9) If $\sin\alpha + \cos\alpha = b$ then sin 2α is equal to .....
   a) $b \geq \sqrt{2}$ if $b^2 - 1$ b) $b > \sqrt{2}$ if $b^2 - 1$ c) $b \geq 1$ if $b^2 - 1$ d) $b \geq 2$ if $b^2 - 1$

10) If the three angles in a triangle are in the ratio 1 : 2 : 3 then the corresponding sides are in the ratio .....
   a) $1 : \sqrt{3} : 2$ b) $1 : \sqrt{2} : 3$ c) 1 : 1 : 2 d) 1 : 1 : $\sqrt{2}$

11) The product of r consective positive integers is divisible by
   a) (r − 1)! b) r^r c) (r + 1)! d) r!

12) Number of sides of a polyson having 44 diagonals is
   a) 4! b) 4 c) 11 d) 22

13) The number of rectangles that a chess board has
   a) 9^9 b) 81 c) 6561 d) 1296

14) The value of 6! − 5! =
   a) 600 b) 120 c) 720 d) 5 × 5!

15) The value of 2 + 4 + 6 + ... + 2n is
   a) $\frac{n(n+1)}{2}$ b) $\frac{n(n-1)}{2}$ c) $\frac{2n(2n+1)}{2}$ d) n(n+1)

16) The co-efficient of x^5 in the series e^{-2x} is

a) $\frac{2}{3}$ b) $\frac{3}{2}$ c) $\frac{-4}{15}$ d) $\frac{4}{15}$

17) For any two positive numbers, the three means AM, GM and HM are in ..... progression

a) arithimetic b) geometric c) hormonic d) none of these

18) Which of the following point lie on the locus of $3x^2+3y^2-8x-12y+17=0$ .....

a) (0, 0) b) (1, 2) c) (−2, 3) d) (0,−1)

19) The image of the point (2, 3) in the line $y=-x$

a) (−3, −2) b) (−3, 2) c) (−2, −3) d) (3, 2)

20) The condition for the pair of straight lines $ax^2+2hxy+by^2+2gx+2fy+c=0$ is perpendicular is .....

a) $h^2 = ab$ b) $h = \sqrt{ab}$ c) $a + b = 0$ d) $a=b$

PART - B

II. Answer any seven question only: Q.No. 30 is compulsory. 7x2=14

21) If $n(A\cap B)=3$ and $n(A\cup B)=10$ then find $n(P(A\Delta B))$

22) Construct a quadratic equation with roots 7 and −3

23) Prove that $\sin(45^\circ + \theta) - \sin(45^\circ - \theta) = \sqrt{2}\sin\theta$

24) Find the area of the triangle whose sides are 13cm, 14cm and 15cm

25) If $\frac{1}{7!}+\frac{1}{8!}=\frac{A}{9!}$ then find the value of A

26) Evaluate $(102)^4$

27) Write the first 6 terms of the exponential series e^{5x}

28) Find the distance between the line $5x + 12y - 3=0$ and the origin?

29) Show that the lines are $3x+2y+9=0$ and $12x+8y-15=0$ are parallel lines

30) Find the distinct permutations of the letters of the word "MISSISSIPPI"

PART - C

III. Answer any seven question only: Q.No. 40 is compulsory. 7x3=21

31) Let f and g be the two functions from R to R defined by $f(x) = 3x-4$ and $g(x) = x^2+3$ Find gof and fog.

32) If $x = \sqrt{2}+\sqrt{3}$ Find the value of $\frac{x^2+1}{x^2-2}$

33) Prove that $\sin^2\frac{\pi}{18}+\sin^2\frac{\pi}{9}+\sin^2\frac{7\pi}{18}+\sin^2\frac{4\pi}{9}=2$

34) Evaluate $\frac{\sin 75^\circ - \sin 15^\circ}{\cos 75^\circ + \cos 15^\circ}$

35) Prove that ${}^{2n}C_n = \frac{2^n(1.3.5.....(2n-1))}{n!}$

36) Find the sum of n terms of the following series 6+66+666+6666+.....

37) Find the value of $\sqrt[3]{65}$

38) Find the equation of the straight lines passing through (8, 3) and having intercepts whose sum is 1

39) Consider the functions i) $f(x) = x^2$ ii) $f(x) = 2x^2$ Draw and Explain it.

40) A model rocket is launced from the ground. The height h reached by the rocket after t seconds from lift off is given $h(t) = -5t^2 + 100t; 0 \le t \le 20$; At what time rocket is 495 feet above the ground?

PART - D

IV. Answer all the questions **7x5=35**

41) In the set Z of integers, define mRn. If m−n is divisible by %. Prove that R is an equivalance relation.

(OR)

If $A+B=45^\circ$ then prove that $(1+\tan A)(1+\tan B) = 2$.

42) Resolve the partial fractions $\frac{7+x}{(1+x)(1+x^2)}$

(OR)

If the letters of the word "GARDEN" are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then find the ranks of the words (i) GARDEN (ii) DANGER

43) If $A + B + C = \pi$ then prove that $\tan\frac{A}{2}\tan\frac{B}{2} + \tan\frac{B}{2}\tan\frac{C}{2} + \tan\frac{C}{2}\tan\frac{A}{2} = 1$

(OR)

If x is so small prove that $\sqrt{\frac{1-x}{1+x}}$ is approximately equal to $1-x+\frac{x^2}{2}$

44) Solve $\frac{x+1}{x+3} < 3$

(OR)

Find the co-efficient of x^6 and co-efficient of x^2 in $\left(x^2 - \frac{1}{x^3}\right)^6$

45) Find the equation of the bisector of the acute angle between the lines $3x+4y+2=0$ and $5x+12y-5=0$

(OR)

If f: R→R is defined by $f(x) = 3x-5$. Prove the f is a bijection and find its inverse

46) (i) Prove that $\log\frac{75}{16} - 2\log\frac{5}{9} + \log\frac{32}{243} = \log 2$

(ii) If the roots are equal for the binary equation $x^2-ax+a+2=0$ find all the values of a

(OR)

Prove that the pair of the straight of the equation of the following $2x^2-xy-3y^2-6x+19y-20=0$ and to find the seperate equation for the above equation.

47) State and Prove Napier's formula

(OR)

Using mathematical induction to prove $x^{2n}-y^{2n}$ is divisible by x+y.

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