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Virudhunagar District Common Examinations
Common Half Yearly Examination - December 2022

Standard 11

MATHEMATICS

PART - I

Time allowed: 3 hours Maximum Marks: 90

20×1=20

Answer all the questions:

1) The solution set of the inequality $|x - 1| \geq |x - 3|$ is
   a) $[0, 2]$ b) $[2, \infty]$ c) $(0, 2)$ d) $(-\infty, 2)$

2) If the function $f:[-3, 3] \to S$ is defined by $f(x) = x^2$ is on to then S is _____
   a) $[-9, 9]$ b) R c) $[-3, 3]$ d) $[0, 9]$

3) If $\frac{1-2x}{3+2x-x^2} = \frac{A}{3-x} + \frac{B}{x+1}$ then the value of A+B is.....
   a) $-\frac{1}{2}$ b) $-\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

4) The value of $2\cos\frac{\pi}{13}\cos\frac{9\pi}{3} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} =$ _____
   a) 0 b) 1 c) −1 d) 2

5) The value of 2 log 10 + 3 log 2 is .....
   a) log 80 b) log 800 c) log 60 d) log 400

6) There are 10 points in a plane and 4 of them are collinear. The number of straight lines joinng any two points is
   a) 45 b) 40 c) 39 d) 38

7) If $nC_{10} > nC_r$ for all possible r, then the value of n is
   a) 10 b) 21 c) 19 d) 20

8) A is matrix of order 3×3 and if |A| = 2 then |3A| = ...
   a) 54 b) 6 c) 27 d) −54

9) $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\cos 80^\circ} =$ _____
   a) $\sqrt{2}$ b) $\sqrt{3}$ c) 2 d)4

10) The sequence $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{3}}$ for m an
   a) AP b) GP c) HP d) AGP

11) The point on the line 2x−3y=5 is equidistance from (1, 2) and (3, 4) is
   a) (7, 3) b) (4, 1) c) (1, −1) d) (3, 4)

12) If the equation $2x^2+kxy+4y^2 = 0$ represents a pair of parallel lines then the value of k is
   a) ±8 b) $\pm 4\sqrt{2}$ c) $\pm 3\sqrt{2}$ d) $\pm 5\sqrt{2}$

13) If A is a square matrix then which of the following is not symmetric?
   a) $A+A^T$ b) AA^T c) A^TA d) $A-A^T$

14) The vectors $\vec{a}-\vec{b}, \vec{b}-\vec{c}, \vec{c}-\vec{a}$ are ..... vectors
   a) parallel b) unit c) mutually perpendicular d) coplanar

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15) $\lim_{x \to \infty} \frac{\sqrt{x^2-1}}{2x+1} =$

a) 1 b) 0 c) -1 d) $\frac{1}{2}$

16) If $g(x) = (x^2+2x+3) f(x)$ and $f(0) = 5$ and $\lim_{x \to 0} \frac{f(x)-5}{x} = 4$ then $g'(0)$ is

a) 20 b) 14 c) 18 d) 12

17) If $x = at^2$, $y = 2at$ then $\frac{d^2y}{dx^2} =$

a) $\frac{-1}{2at^2}$ b) $\frac{-1}{2at^3}$ c) $\frac{1}{2at^2}$ d) $\frac{1}{2at^3}$

18) If $\lambda\vec{i} + 2\lambda\vec{j} + 2\lambda\vec{k}$ is a unit vector, then the value of λ is .....

a) $\frac{1}{3}$ b) $\frac{1}{4}$ c) $\frac{1}{9}$ d) $\frac{1}{2}$

19) The sum of the binomial co-efficients is

a) 2n b) 2^n c) n^2 d) 1

20) If $nC_{12} = nC_8$ then the value of n is

a) 12 b) 6 c) 4 d) 20

Part -II

II. Answer any seven questions. Q.No. 30 is compulsory. **7×2=14**

21) If $n(P(A)) = 1024$, $n(A \cup B) = 15$ and $n(P(B)) = 32$, then find $n(A \cap B)$

22) Solve: $|2x-3| = |x-5|$

23) Evaluate: $\left(\left((256)^{-\frac{1}{2}}\right)^{-\frac{1}{4}}\right)^3$

24) Find the value of (i) $\tan 105°$ (ii) $\sec^{-1}\left(-\sqrt{2}\right)$

25) If $10P_r = 7P_{r+2}$ find 'r'

26) Find four numbers G_1, G_2, G_3, G_4 so that the sequence $12\ G_1\ G_2\ G_3\ G_4\ \frac{3}{8}$ is in geometric progression.

27) Construct the matrix $A = [aij]_{3\times3}$ where $aij = i-j$. State whether A is a symmetric or skew-symmetric.

28) If $\left(\frac{1}{2}, \frac{1}{\sqrt{2}}, a\right)$ are the direction cosines of some vector then find 'a'.

29) Find $\frac{dy}{dx}$, if $x^2+y^2 = 1$.

30) Find the distance between the parallel lines $3x-4y+5 = 0$ and $6x-8y-15 = 0$.

Part -III

III. Answer any seven questions. Q.No. 40 is compulsory. **7×3=21**

31) Find the range of the function $\frac{1}{2\cos x - 1}$

32) Solve: $\log_2 x - 3\log_{\frac{1}{2}} x = 6$

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

34) Find the number if strings that can be made using all letters of the word BLEAT

35) Find the value of 'n' if the sum of n terms of the series $\sqrt{3} + \sqrt{75} + \sqrt{243} + \ldots$ is $435\sqrt{3}$

36) Evaluate: $\lim_{x \to 0} \frac{2^x - 3^x}{x}$

37) Find the area of the triangle whose vertices are A(3, −1, 2) B(1, −1, −3) and C(4, −3, 1)

38) If $A = \begin{bmatrix} \frac{1}{2} & \alpha \\ 0 & \frac{1}{2} \end{bmatrix}$, prove that $\sum_{K=1}^{n} \det(A^K) = \frac{1}{3}\left(1 - \frac{1}{4^n}\right)$

39) Find the nearest point on the line $x-2y = 5$ from the origin.

40) Differentiate: $x^y = y^x$.

Part -IV

IV. Answer all the questions: **7×5=35**

41) a] On the set of natural numbers, Let R be the relation defined by aRB if $2a+3b = 30$. Write down the relation by listing all the pairs-check whether it is (i) Reflexive (ii) Symmetric (iii) Transitive (iv) Equivalence

(OR)

b] Prove: $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$

42) a] Resolve into Partial fractions: $\frac{2x}{(x^2+1)(x-1)}$

(OR)

b] Solve: $\sqrt{3}\tan^2\theta + (\sqrt{3}-1)\tan\theta - 1 = 0$

43) a] If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$ show that $(1-x^2)y_2 - 3xy - y = 0$

(OR)

b] If the points P(6, 2) and Q(−2, 1) and R are the vertices of a ΔPQR and R is the point on the locus $y = x^2-3x+4$, then find the equation of the locus of centriod of ΔPQR

44) a] Prove that $\sqrt{\frac{1-x}{1+x}}$ is approximately equal to $1 - x + \frac{x^2}{2}$ when x is very small.

(OR)

b] A van has 8 seats. It has two seats in the front with two rows of three seats behind. The van belongs to a family. Consisting of seven memmbers F, M, S_1, S_2, S_3, D_1, D_2. How many ways can the family sit on the van if

i) There are no restriction?

ii) Either F or M drives the van?

iii) D_1 D_2 sits next to a window and F is driving?

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45) a] If the equation $\lambda x^2-10xy+12y^2+5x-16y-3 = 0$ represents a pair of straight lines find

i) the value of λ and the separated equations of the lines

ii) angle between the lines.

(OR)

b] State and prove Napier's Formula.

46) a] Solve the problem by using Factors Theorem.

Show that $\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc.$

(OR)

b] Three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $|\vec{a}| = 2$, $|\vec{b}| = 3$, $|\vec{c}| = 4$ and $\vec{a}+\vec{b}+\vec{c} = \vec{0}$. Find $4\vec{a}.\vec{b}+3\vec{b}.\vec{c}+3\vec{c}.\vec{a}$.

47) a] Find $\frac{dy}{dx}$ if $x = a\cos^3 t$, $y = a\sin^3 t$.

(OR)

b] For any vector $\vec{a}$, prove that $|\vec{a}\times\vec{i}|^2 + |\vec{a}\times\vec{j}|^2 + |\vec{a}\times\vec{k}|^2 = 2|\vec{a}|^2$

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