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Tsi11M

Tenkasi District
Common Half Yearly Exam, December - 2024

23-12-24

Standard 11
MATHS

Time: 3.00 Hours Marks: 90

I. Choose the best answer: **20×1=20**

1) If two sets A and B have 17 elts in common, then the no. of elts common to the set A×B and B×A is
a) 2^{17} b) 17^2 c) 34 d) insufficient data

2) Let $f: \mathbb{R} \to \mathbb{R}$ be denoted by $f(x) = 1-|x|$ then the range of f(x) is
a) $\mathbb{R}$ b) $(1, \infty)$ c) $(-1, \infty)$ d) $(-\infty, 1)$

3) The no. of roots of $(x+3)^4+(x+5)^4 = 16$ is
a) 4 b) 2 c) 3 d) 0

4) If 3 is the logarithm of 343, then the base is
a) 5 b) 7 c) 6 d) 9

5) The max, 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) 9 d) 4

6) If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2+ax+b = 0$ then $\frac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$ is equal to
a) $\frac{b}{a}$ b) $\frac{a}{b}$ c) $-\frac{a}{b}$ d) $-\frac{b}{a}$

7) The no. of rectangles that a chessboard has.
a) 81 b) 9^9 c) 1296 d) 6561

8) The product of r consecutive +ve integers is divisible by
a) r! b) (r−1)! c) (r+1)! d) r^r

9) If a, 8, b are in A.P., a, 4, b are in G.P. and if a, x, b are in H.P. then x is
a) 2 b) 1 c) 4 d) 16

10) Straight line joining the pts (2, 3) and (−1, 4) passing through the pt (α, β) if
a) $\alpha+2\beta = 7$ b) $3\alpha+\beta = 9$ c) $\alpha+3\beta = 11$ d) $3\alpha+\beta = 11$

11) If one of the lines given by $6x^2-xy+4cy^2 = 0$ is $3x+4y = 0$ then c equals to
a) −3 b) −1 c) 3 d) 1

12) The value of the determinant of $A = \begin{vmatrix} 0 & a & -b \\ -a & 0 & c \\ b & -c & 0 \end{vmatrix}$ is
a) $-2abc$ b) abc c) 0 d) $a^2+b^2+c^2$

13) If $A = \begin{vmatrix} 1 & -1 \\ 2 & -1 \end{vmatrix}$ and $B = \begin{vmatrix} a & 1 \\ b & -1 \end{vmatrix}$ and $(A+B)^2 = A^2+B^2$ then the value of a and b are
a) a = 4, b = 1 b) a = 1, b = 4 c) a = 0, b = 4 d) a = 2, b = 4

14) 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) $\frac{1}{2}$

15) If the projection of $5\vec{i} - \vec{j} - 3\vec{k}$ on the vector $\vec{i} + 3\vec{j} + \lambda\vec{k}$ is same as the projection of $\vec{i} + 3\vec{j} + \lambda\vec{k}$ on $5\vec{i} - \vec{j} - \vec{k}$ then λ is equal to
a) ±4 b) ±3 c) ±5 d) ±1

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16) $\lim_{x \to 0} \frac{8^x - 4^x - 2^x + 1^x}{x^2} =$

a) 2 log 2 b) 2 $(\log 2)^2$ c) log 2 d) 3 log 2

17) The differential co-efficient of $\log_{10} x$ with respect to $\log_x 10$ is

a) 1 b) $-(\log_{10} x)^2$ c) $(\log_x 10)^2$ d) $\frac{x^2}{100}$

18) $\frac{a'}{dx}(a^x) =$

a) $a^x \log a$ b) $\frac{a^x}{\log a}$ c) $\frac{\log a}{a^x}$ d) $\frac{1}{a^x \log a}$

19) $e^{-4x} \cos x \, dx$ is

a) $\frac{e^{-4x}}{17}(4\cos x - \sin x) + c$ b) $\frac{e^{-4x}}{17}(-4\cos x + \sin x) + c$

c) $\frac{e^{-4x}}{17}(4\cos x + \sin x) + c$ d) $\frac{e^{-4x}}{17}(-4\cos x - \sin x) + c$

20) $\sqrt{x^2 + a^2}\, dx =$

a) $\frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\log\left(x + \sqrt{x^2+a^2}\right) + c$ b) $\frac{x}{2}\sqrt{x^2-a^2} + \frac{a^2}{2}\log\left(x + \sqrt{x^2-a^2}\right) + c$

c) $\frac{x}{2}\sqrt{x^2+a^2} - \frac{a^2}{2}\log\left(x + \sqrt{x^2+a^2}\right) + c$ d) $\frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\log\left(x + \sqrt{x^2-a^2}\right) + c$

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

21) If n[P(A)] = 1024, n(A∪B) = 15 and n[P(B)] = 32 then find n(A∩B)

22) If α and β are the roots of the quadratic equation $x^2 + \sqrt{2}\,x + 3 = 0$ form a quadratic poly with zeroes $\frac{1}{\alpha}, \frac{1}{\beta}$

23) Prove that $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \frac{1 + \sin\theta}{\cos\theta}$

24) Prove that ${}^{10}C_2 + 2 \times {}^{10}C_3 + {}^{10}C_4 = {}^{12}C_4$

25) If 5th and 9th terms of a harmonic progression are $\frac{1}{19}$ and $\frac{1}{35}$ find the 12th term of the sequence.

26) Show that the pts $0, \frac{-3}{2}$, (1, −1) and $2, -\frac{1}{2}$ are collinear.

27) Evaluate $e^{-5x} \sin 3x \, dx$

28) If G is the centroid of the ΔABC, Prove that $\overline{GA} + \overline{GB} + \overline{GC} = \bar{0}$

29) Differntiate: $y = e^{\sin x}$

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30) If $A = \begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{matrix}$ show that A^2 is a unit matrix.

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

31) Find the range of the fun $f(x) = \frac{1}{1-3\cos x}$

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

33) Find the values of other trigonometric fun of $\cos\theta = \frac{2}{3}$, θ lies in I quadrant.

34) If the letters of word MATHEMATICS are permitted in all possible ways and the strings thus formed are arranged in the dictionary order then find the rank of the word 'MATHEMATICS'

35) Compute the first n terms of the series 8+88+888+.....

36) Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

37) If $\vec{a}, \vec{b}$ are unit vectors and θ is the angle between them show that

(i) $\sin\frac{\theta}{2} = \frac{1}{2}|a-b|$ (ii) $\cos\frac{\theta}{2} = \frac{1}{2}|a+b|$

38) Evaluate: $\lim_{x\to 0}(1+\sin x)^{2\csc x}$

39) Differentiate: $y = \sqrt{x+\sqrt{x}}$

40) The slope of one of the straight lines $ax^2+2hxy+by^2 = 0$ is twice of the other show that $8h^2 = 9ab$

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

41) From the curve $y = x$ draw (i) $y = -x$ (ii) $y = 2x$ (iii) $y = x+1$ (iv) $y = \frac{1}{2}x+1$

(OR)

Evaluate: $\frac{3x+5}{x^2+4x+7}dx$

42) Resolve the rational expression $\frac{x+12}{(x+1)^2(x-2)}$ into partial fraction.

(OR)

Prove that $\lim_{\theta\to 0}\frac{\sin\theta}{\theta} = 1$

43) If $A+B+C = \frac{\pi}{2}$, then prove that $\sin 2A + \sin 2B + \sin 2C = 4\cos A\cos B\cos C$

(OR)

Prove that $\sqrt[3]{x^3+7} - \sqrt[3]{x^3+4} \simeq \frac{1}{x^2}$ when x is large.

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44) By the principle of mathematical induction prove that for all integers, $n \geq 1$

$$1^2+2^2+3^2+.....+n^2 = \frac{n(n+1)(2n+1)}{6}$$

(OR)

Express the matrix $A = \begin{matrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{matrix}$ as the sum of a symmetric and skew-symmetric matrices.

45) The equation $\lambda x^2-10xy+12y^2+5x-16y-3 = 0$ represent a pair of straight lines find (i) the value of λ and the separate equation of the lines (ii) point of intersection of the lines (iii) angle between the lines.

(OR)

Show that the points whose position vectors $4\vec{i}+5\vec{j}+\vec{k}$, $-\vec{j}-\vec{k}$, $3\vec{i}+9\vec{j}+4\vec{k}$ and $-4\vec{i}+4\vec{j}+4\vec{k}$ are coplanar.

46) Using factor theorem show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix}$ = (a+b+c) (a–b) (b–c) (c–a)

(OR)

Evaluate: $\int \frac{1}{\sqrt{1+x}+\sqrt{x}}\,dx$

47) If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, showthat $(1-x^2)y_2-3xy_1-y = 0$

(OR)

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

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