HALF YEARLY EXAM

QUESTION PAPER

ORIGINAL EXAM PAPERS



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Tenkasi District

Common Half Yearly Examination - 2023

Standard 11

MATHEMATICS

Time: 3.00 Hours

Marks: 90

I. Choose the correct Answer: **20x1=20**

1) If $n[(A\times B)\cap(A\cap C)] = 8$ and $n(B\cap C) = 2$ then $n(A)$ =
   a) 6 b) 4 c) 8 d) 16

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

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

4) The number of roots of $(x+3)^4+(x+5)^4 = 16$ is
   a) 4 b) 3 c) 2 d) 0

5) $\cos 1° + \cos 2° + \ldots\ldots + \cos 179° =$
   a) 0 b) 1 c) -1 d) 89

6) If $\tan\alpha$ and $\tan\beta$ are 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) If $\left(a^2-a\right)_{C_2} = \left(a^2-a\right)_{C_4}$ then the value of a is
   a) 2 b) 3 c) 4 d) 5

8) In a plane there are 10 points are there out of which 4 points are collinear, then the number of triangles formed is
   a) 110 b) $^{10}C_3$ c) 120 d) 116

9) The n^{th} term of the sequence 1.2.4.7.11..... is
   a) n^3+3n^2+2n b) n^3-3n^2+3n c) $\frac{n(n+1)(n+2)}{3}$ d) $\frac{n^2-n+2}{2}$

10) The sum of an infinite G.P. is 18. If the first term is 6, the common ratio is
   a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{6}$ d) $\frac{3}{4}$

11) The slope of the line which makes an angle 45° with the line $3x-y = -5$ are
   a) 1, -1 b) $\frac{1}{2}, -2$ c) $1, \frac{1}{2}$ d) $2, -\frac{1}{2}$

12) A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is
   a) 6 b) 3 c) 0 d) -6

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

14) If (1, 2, 4) and (2, −3λ, −3) are initial and terminal points of the vector $\vec{i} + 5\vec{j} - 7\vec{k}$ the value of λ is equal to

a) $\frac{7}{3}$ b) $-\frac{7}{3}$ c) $-\frac{5}{3}$ d) $\frac{5}{3}$

15) $\lim_{x \to 0} \frac{e^{\sin x} - 1}{x} =$

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

16) $\frac{d}{dx}\left(e^{x+5\log x}\right)$ is

a) $e^x.x^4(x+5)$ b) $e^x.x(x+5)$ c) $e^x + \frac{5}{x}$ d) $e^x - \frac{5}{x}$

17) If f(x) = x+2 then f'[f(x)] at x = 4 is

a) 8 b) 1 c) 4 d) 5

18) $\int 2^{3x+5}\,dx$ is

a) $\frac{3\left(2^{3x+5}\right)}{\log 2} + c$ b) $\frac{2^{3x+5}}{2\log(3x+5)} + c$ c) $\frac{2^{3x+5}}{2\log 3} + c$ d) $\frac{2^{3x+5}}{3\log 2} + c$

19) The pt of intersection of the line x+3y+2 = 0 and 2x−y−3 = 0 is

a) (1, 1) b) (−1, 1) c) (1, −1) d) (−1, −1)

20) The minor of the element in the i^{th} row, j^{th} column is denoted by

a) M_{ij} b) M_{ji} c) $(-1)^{i+j} M_{ij}$ d) $(-1)^{j+i} M_{ji}$

II. Answer any 7 questions. Qn.no. 30 is compulsory. **7x2=14**

21) If A = {1, 2, 3, 4} and B = {3, 4, 5, 6} find n[(A∪B)×(A∩B)×(AΔB)]

22) If a and b are roots of the equation $x^2 - px + q = 0$. Find the value of $\frac{1}{a} + \frac{1}{b}$

23) Find the general solution of sec θ = −2

24) A mathematics club has 15 members. In that 8 are girls 6 of the members are to be selected for a competition and half of them should be girls. How many ways of these selection are possible?

25) Expand $(1+x)^{2/3}$ upto four terms for |x| < 1

26) Find the value of K, if the equation $12x^2 + 7xy - 12y^2 - x + 7y + k = 0$ represents a pair of straight line.

27) For what value of x, the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & x^3 \\ 2 & -3 & 0 \end{bmatrix}$ is skew symmetric.

28) Find the angle between the vectors $5\vec{i} + 3\vec{j} + 4\vec{k}$ and $6\vec{i} - 8\vec{j} - \vec{k}$

29) If $y = \frac{x+1}{x-1}$ then find $\frac{dy}{dx}$

30) Evaluate: $\int \sqrt{4 - x^2}\,dx$

III. Answer any 7 questions. Qn. no. 40 is compulsory. **7x3=21**

31) Draw the graph $f(x) = |x|$, $f(x) = |X-1|$, $f(x) = |x+1|$

32) If $f:[R-\{-1, 1\} \to R$ is defined by $f(x) = \frac{x}{x^2-1}$, verify whether f is one-to-one or not.

33) Prove that $32\sqrt{3}$, $\sin \pi/48 \cos \pi/48 \cos \pi/24 \cos \pi/12 \cos \pi/6 = 3$

34) Find the rank of the word BLEAT

35) If a, b, c are in geometric progression and if $a^{1/x} = b^{1/y} = c^{1/z}$ then prove that x, y, z are in arithmetic progression.

36) Find the equation of lines passing through the point of intersection of lines $4x-y+3 = 0$ and $5x+2y+7 = 0$ and (i) through the piont $(-1, 2)$ (ii) parallel to $x-y+5 = 0$.

37) Find the area of the triangle whose vertics are $(-2, -3)$, $(3, 2)$ and $(-1, -8)$

38) Evaluate $\lim_{X \to 0} \frac{\sin x(1-\cos x)}{x^3}$

39) Evaluate: $\int e^{-4x} \sin 2x \, dx$

40) If ABCD is a quadrilateral and E and F are the mid points of AC and BD respectively then prove that $\overline{AB} + \overline{AD} + \overline{CB} + \overline{CD} = 4\overline{EF}$

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

41) a] Write the value of f at $-4, 1, -2, 7, 0$ if $f(x) = \begin{cases} -x+4, & \text{if } -\infty < x \le -3 \\ x+4, & \text{if } -3 < x < -2 \\ x^2-x, & \text{if } -2 \le x < 1 \\ x-x^2, & \text{if } 1 \le x < 7 \\ 0, & \text{otherwise} \end{cases}$

(OR)

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

42) a] If $A+B+C = \pi$, prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1-2 \cos A \cos B \cos C$

(OR)

b] Show that $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$

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

(OR)

b] Solve $\log_{5-x}(x^2-6x+65) = 2$

44) a] Show that the equation $9x^2-24xy+16y^2-12x+16y-12 = 0$ represents a pair of parallel lines. Find the distance between them.

(OR)

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

45) a] Resolve the rational expressions into partial fractions $\frac{9}{(x+1)(x+2)^2}$

(OR)

b] The AM of two numbers exceeds their GM by 10 and HM by 16. Find the numbers.

46) a] Prove that $\sqrt[3]{x^2+7}-\sqrt[3]{x^2+4}$ is approximately equal to $1/x^2$ when x is large.

(OR)

b] 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.

47) a] If $y = (\cos^{-1}x)^2$, prove that $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-2=0$.

Hence find y_2 when $x = 0$.

(OR)

b] $\int \sqrt{9-(2x+5)^2}\,dx$

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