Tsi11M

Tenkasi District Common Examinations
Second Revision Examination - February 2023

22-02-2023

Time: 3.00 hrs

Standard 11

MATHEMATICS

Part - A

Marks: 90

Choose the correct answer: Answer all the questions: **20×1=20**

1) The range of the function $\frac{1}{1-2\sin x}$ is

a) $(-\infty,-1)\cup\left(\frac{1}{3},\infty\right)$ b) $\left(-1,\frac{1}{3}\right)$ c) $\left[-1,\frac{1}{3}\right]$ d) $(-\infty,-1]\cup\left[\frac{1}{3},\infty\right)$

2) If two sets A and B have 17 elements in common, then the number of elements common to the set A×B and B×A is

a) 2^{17} b) 17^2 c) 34 d) insufficient data

3) The solution set of the following inequality $|x-1| \geq |x-3|$ is

a) [0, 2] b) [2, ∞] c) (0, 2) d) (−∞, 2)

4) The number of roots of $(x+3)^4+(x+5)^4 = 16$ is

a) 4 b) 2 c) 3 d) 0

5) $\cos 2\theta \cos 2\phi + \sin^2(\theta-\phi) - \sin^2(\theta+\phi)$ is equal to

a) $\sin 2(\theta+\phi)$ b) $\cos 2(\theta+\phi)$ c) $\sin 2(\theta-\phi)$ d) $\cos 2(\theta-\phi)$

6) There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points is

a) 45 b) 40 c) 39 d) 38

7) The product of first 'n' odd natural numbers equals

a) $2nC_n \times nP_n$ b) $\left(\frac{1}{2}\right)^n \times 2nC_n \times nP_n$ c) $\left(\frac{1}{4}\right)^n \times 2nC_n \times 2nP_n$ d) $nC_n \times nP_n$

8) The n^{th} term of the sequence $\frac{1}{2},\frac{3}{4},\frac{7}{8},\frac{15}{16},\ldots\ldots$ is

a) 2^n-n-1 b) $1-2^{-n}$ c) $2^{-n}+n-1$ d) 2^{n-1}

9) The intercepts of the perpendicular bisector of the line segment joining (1, 2) and (3, 4) with co-ordinate axes are

a) 5, −5 b) 5, 5 c) 5, 3 d) 5, −4

10) The locus of a point P that moves at a constant distant of three units from the y-axis is

a) y = 2 b) x = 3 c) x = 2 d) y = 3

11) If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if xy = 1, then $\det(AA^T)$ is equal to

a) $(a-1)^2$ b) $(a^2+1)^2$ c) a^2-1 d) $(a^2-1)^2$

12) The matrix $A = [a_{ij}]_{2\times2}$ constructed where a_{ij} is given by $a_{ij} = (2i-3j)^2$ is

a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ b) $\begin{bmatrix} \frac{1}{2} & 8 \\ \frac{1}{2} & 2 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 16 \\ 1 & 4 \end{bmatrix}$ d) $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

13) If $\vec{r} = \frac{9\vec{a}+7\vec{b}}{16}$ then the point P whose position vector $\vec{r}$ divides the line joining the points with position vectors $\vec{a}$ and $\vec{b}$ in the ratio

a) 7:9 internally b) 9:7 internally c) 9:7 externally d) 7:9 externally

14) If the projection of $5\hat{i}-\hat{j}-3\hat{k}$ on the vector $\hat{i}+3\hat{j}+\lambda\hat{k}$ is same as the projection of $\hat{i}+3\hat{j}+\lambda\hat{k}$ on $5\hat{i}-\hat{j}-3\hat{k}$, then λ is equal to

a) ±4 b) ±3 c) ±5 d) ±1

15) The value of $\lim_{x \to K} x-[x]$, where K is an integer is

a) -1 b) 1 c) 0 d) 2

16) If $y=\frac{(1-x)^2}{x^2}$, then $\frac{dy}{dx}$ is

a) $\frac{2}{x^2}+\frac{2}{x^3}$ b) $-\frac{2}{x^2}+\frac{2}{x^3}$ c) $-\frac{2}{x^2}-\frac{2}{x^3}$ d) $-\frac{2}{x^3}+\frac{2}{x^2}$

17) Differentiate $\cos^2 x$

a) $\sin 2x$ b) $-\sin 2x$ c) $\cos 2x$ d) $-\cos 2x$

18) $\int\frac{x+2}{\sqrt{x^2-1}}$ is

a) $\sqrt{x^2-1}-2\log\left|x+\sqrt{x^2-1}\right|+c$ b) $\sin^{-1}x-2\log\left|x+\sqrt{x^2+1}\right|+c$

c) $2\log\left|x+\sqrt{x^2-1}\right|-\sin^{-1}x+c$ d) $\sqrt{x^2-1}+2\log\left|x+\sqrt{x^2-1}\right|+c$

19) If x and y be two events such that $P\left(X/Y\right)=1/2$, $P\left(Y/X\right)=1/3$ and $P(X\cap Y)=1/6$, then $P(X\cup Y)$ is

a) $1/3$ b) $2/5$ c) $1/6$ d) $2/3$

20) If A and B are two events associated with a random experiment for which P(A) = 0.35, P(A or B) = 0.85 and P(A and B) = 0.15, then P(only A) is

a) 0.65 b) 0.50 c) 0.20 d) 0.35

Part - B

Answer any seven questions. Question 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: $3x-5 \le x+1$, for x

23) How many three digit numbers are there with 3 in the unit place without repetition?

24) Show the points $\left(0,-3/2\right)$ $(1,-1)$ and $\left(2,-1/2\right)$ are collinear.

25) If A is a 3×4 matrix and B is a matrix such that both A^TB and BA^T are defined what is the order of the matrix B?

26) Find a point whose position vector has magnitude 5 and parallel to the vector $4\hat{i}-3\hat{j}+10\hat{k}$.

27) Calculate $\lim_{x \to 2}\left(x^3-3x+6\right)\left(-x^2+15\right)$

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28) Differentiate: $y = \sin x^n$

29) Integrate: $e^x[\tan x + \log \sec x]$

30) Find the probability of getting the number 9, when a usual die is rolled.

Part - C

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

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

32) Prove that $\log 2 + 16 \log \frac{16}{15} + 12 \log \frac{25}{24} + 7 \log \frac{81}{80} = 1$

33) Find the value of $\sin 18°$

34) Write the n^{th} term of the sequence $\frac{3}{1^2 2^2}, \frac{5}{2^2 3^2}, \frac{7}{3^2 4^2}, \ldots$ as a difference of two terms.

35) Show that $\begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ca-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2$

36) Let $\vec{a}, \vec{b}, \vec{c}$ be unit vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c} = 0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\pi/3$. Prove that $\vec{a} = \pm \frac{2}{\sqrt{3}}(\vec{b} \times \vec{c})$

37) Find the derivative of x^x with respect to $x \log x$

38) Show that $\lim_{n \to \infty} \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots + \frac{1}{n(n+1)} = 1$

39) If A and B are independent then, prove that $\bar{A}$ and $\bar{B}$ are also independent.

40) Find the family of straight lines

(i) parallel to (ii) perpendicular to $4x-3y+24 = 0$

Part - D

Answer all the questions: **7×5=35**

41) a] Find the largest possible domain of the real valued function $f(x) = \frac{\sqrt{4-x^2}}{\sqrt{x^2-9}}$

(OR)

b] Prove that $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$

42) a] Resolve into partial fractions $\frac{x+12}{(x+1)^2(x-2)}$

(OR)

b] Show that $\lim_{x \to 0^+} x\left[\left[\frac{1}{x}\right]+\left[\frac{2}{x}\right]+\ldots\ldots+\left[\frac{15}{x}\right]\right]=120$

43) a] If A+B+C = π, prove that

$$\cos A + \cos B + \cos C = 1+4\sin\left(A/2\right)\sin\left(B/2\right)\sin\left(C/2\right)$$

(OR)

b] If sin y = x sin (a+y) then prove that $\frac{dy}{dx}=\frac{\sin^2(a+y)}{\sin a}, a \neq n\pi$

44) a] Using the Mathematical induction, show that for any natural number n,

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\ldots\ldots+\frac{1}{n(n+1)(n+2)}=\frac{n(n+3}{4(n+1)(n+2)}$$

(OR)

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b] Integrate: $\int \frac{2x+3}{\sqrt{x^2+x+1}}dx$

45) a] If p−q is small compared to either p or q, then show that

$$\sqrt[n]{\frac{p}{q}} \simeq \frac{(n+1)p+(n-1)q}{(n-1)p+(n+1)q}$$

(OR)

b] Prove that the points whose position vectors $2\hat{i}+4\hat{j}+3\hat{k}$, $4\hat{i}+\hat{j}+9\hat{k}$ and $10\hat{i}-\hat{j}+6\hat{k}$ form a right angled triangle.

46) a] If the pair of straight lines $x^2-2kxy-y^2=0$ bisect the angle between the pair of straight lines $x^2-2lxy-y^2=0$. Show that the later pair also bisects the angle between the former.

(OR)

b] A consulting firm rents car from three agencies such that 50% from agency L, 30% from agency M and 20% from agency N. If 90% of the cars fro L, 70% of cars from M and 60% of the cars from N are in good conditions what is the probability that the firm will get a car in good condition from agency N?

47) a] Integrate with respect to x: $\sin^{-1}\left[\frac{2x}{1+x^2}\right]$

(OR)

b] If $\theta+\phi=\alpha$ and $\tan\theta = k.\tan\phi$, then prove that $\sin(\theta-\phi)=\frac{K-1}{K+1}\sin\alpha$.
