# RAVI MATHS TUITION CENTER, CHENNAI – 82. PH - 8056206308

**12TH MATHS MODEL PAPER 2** Date : 29-Nov-19

12th Standard

Maths

Reg.No. : | | | | | | |

Exam Time : 03:00:00 Hrs Total Marks : 90

PART - I

20 x 1 = 20

ANSWER ALL

1) If A = $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, B = adj A and C = 3A, then $\frac{|adjB|}{|C|}$ =

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

2) Let A be a 3 x 3 matrix and B its adjoint matrix If |B|=64, then |A|=

(a) ±2 (b) ±4 (c) ±8 (d) ±12

3) The area of the triangle formed by the complex numbers z,iz, and z+iz in the Argand's diagram is

(a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$

4) If, $i^2 = -1$, then $i^1 + i^2 + i^3 + ....+$ up to 1000 terms is equal to

(a) 1 (b) -1 (c) i (d) 0

5) A polynomial equation in x of degree n always has

(a) n distinct roots (b) n real roots (c) n imaginary roots (d) at most one root

6) Ifj(x) = 0 has n roots, thenf'(x) = 0 has __________ roots

(a) n (b) n -1 (c) n+1 (d) (n-r)

7) $sin^{-1}\frac{3}{5} - cos^{-1}\frac{12}{13} + sec^{-1}\frac{5}{3} - cosec^{1-}\frac{13}{2}$ is equal to

(a) $2\pi$ (b) $\pi$ (c) 0 (d) $\tan^{-1}\frac{12}{65}$

8) The number of solutions of the equation $tan^{-1}2x + tan^{-1}3x = \frac{\pi}{4}$

(a) 2 (b) 3 (c) 1 (d) none

9) The circle $x^2+y^2=4x+8y+5$intersects the line$3x-4y=m$ at two distinct points if

(a) 15< m < 65 (b) 35< m < 85 (c) −85< m < −35 (d) −35< m < 15

10) $y^2 - 2x - 2y + 5 = 0$ is a

(a) circle (b) parabola (c) ellipse (d) hyperbola

11) $\vec{a}.\vec{b} = \vec{b}.\vec{c} = \vec{c}.\vec{a} = 0$ , then the value of $[\vec{a}, \vec{b}, \vec{c}]$ is

(a) $|\vec{a}||\vec{b}||\vec{c}|$ (b) $\frac{1}{3}|\vec{a}||\vec{b}||\vec{c}|$ (c) 1 (d) -1

12) The number of vectors of unit length perpendicular to the vectors $\left(\hat{i} + \hat{j}\right)$ and $\left(\hat{j} + \hat{k}\right)$ is

(a) 1 (b) 2 (c) 3 (d) ∞

13) The position of a particle moving along a horizontal line of any time t is given by set) = $3t^2$ -2t- 8. The time at which the particle is at rest is

(a) t= 0 (b) $t = \frac{1}{3}$ (c) t =1 (d) t = 3

14) If the rate of increase of s =$x^3$-$5x^2$+5x+8 is twice the rate of increase of x, then one value of x is

(a) $\frac{3}{5}$ (b) $\frac{10}{3}$ (c) $\frac{3}{10}$ (d) $\frac{1}{3}$

15) If u (x, y) = $e^{x2+y2}$, then $\frac{\partial u}{\partial x}$ is equal to

(a) $e^{x2+y2}$ (b) 2xu (c) $x^2u$ (d) $y^2u$

16) If $\log_e 4 = 1.3868$, then $\log_e 4.01$ =

(a) 1.3968 (b) 1.3898 (c) 1.3893 (d) none

17) If $f(x) = \int_0^x t \cos t\, dt,$ then $\frac{dx}{dx}$

(a) cos x-x sin x (b) sin x+x cos x (c) x cos x (d) x sin x

18) The order and degree of the differential equation $\sqrt{\sin \quad x}(dx + dy) = \sqrt{\cos \quad x}(dx - dy)$

(a) 1,2 (b) 2,2 (c) 1,1 (d) 2,1

19) Consider a game where the player tosses a sixsided fair die. H the face that comes up is 6, the player wins Rs.36, otherwise he loses Rs. $k^2$ , where k is the face that comes up k = {I, 2,3,4, 5}.

The expected amount to win at this game in Rs is

(a) $\frac{19}{6}$ (b) $-\frac{19}{6}$ (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

20) Which one of the following is a binary operation on N?

(a) Subtraction (b) Multiplication (c) Division (d) All the above

## PART II

7 x 2 = 14

ANSWER ANY 7 QUESTIONS IN WHICH QUESTION NO. 30 IS COMPULSORY

21) If A is symmetric, prove that then adj Ais also symmetric.

22) Write $\frac{3 + 4i}{5 - 12i}$ in the x+iy form, hence find its real and imaginary parts.

23) Formalate into a mathematical problem to find a number such that when its cube root is added to it, the result is 6.

24) Find all the values of x such that

$-10\pi \le x \le 10\pi$ and sin x=0

25) Examine the position of the point (2,3) with respect to the circle $x^2+y^2-6x-8y+12=0$.

26) If $2\hat{i} - \hat{j} + 3\hat{k}, 3\hat{i} + 2\hat{j} + \hat{k}, \hat{i} + m\hat{j} + 4\hat{k}$ are coplanar, find the value of m.

27) Use differentials to find $\sqrt{25.2}$

28) Prove that $\int_0^{\frac{\pi}{2}} \log(\tan x)dx$

29) Two balls are chosen randomly from an urn containing 6 red and 8 black balls. Suppose that we win Rs. 15 for each red ball selected and we lose Rs. 10 for each black ball selected. X denotes the winning amount, then find the values of X and number of points in its inverse images.

30) Let A = $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ be any two boolean matrices of the same type. Find AvB and A^B.

## PART III

7 x 3 = 21

ANSWER ANY 7 QUESTIONS IN WHICH QUESTION NO. 40 IS COMPULSORY

31) Verify $(AB)^{-1} = B^{-1}A^{-1}$ with A = $\begin{bmatrix} 0 & -3 \\ 1 & 4 \end{bmatrix}$, B = $\begin{bmatrix} -2 & -3 \\ 0 & -1 \end{bmatrix}$.

32) Find the values of the real numbers x and y, if the complex numbers (3−i)x−(2−i)y+2i +5 and 2x+(−1+2i)y+3+ 2i are equal.

33) If α, β and γ are the roots of the cubic equation $x^3+2x^2+3x+4=0$, form a cubic equation whose roots are, 2α, 2β, 2γ

34)

Find the domain of $\cos^{-1}(\frac{2+sinx}{3})$

35) Find the centre and radius of the circle$3x^2+(a+1)y^2+6x-9y+a+4=0$.

36) In triangle, ABC the points, D, E, F are the midpoints of the sides, BC, CA and AB respectively. Using vector method, show that the area of ΔDEF is equal to $\frac{1}{2}$ (area of ΔABC )

37) A particle moves so that the distance moved is according to the law s(t) = $s(t) = \frac{t^3}{3} - t^2 + 3$ . At what time the velocity and acceleration are zero respectively?

38) Evaluate :$\int_0^{\frac{\pi}{\cdot}} \frac{sec\ x\ tan\ x}{1+sec^2 x} dx$

39) Two balls are chosen randomly from an urn containing 6 white and 4 black balls. Suppose that we win Rs.30 for each black ball selected and we lose Rs.20 for each white ball selected. If X denotes the winning amount, then find the values of X and number of points in its inverse images.

40) Determine whether ∗ is a binary operation on the sets given below.
a*b=b=a.|b| on R

PART - IV 7 x 5 = 35

ANSWER ALL

41) a) Using integration, find the area of the region which is bounded by x-axis, the tangent and normal to the circle $x^2\ y^2 + = 4$ drawn at $(1,\sqrt{3})$

**(OR)**

b) Establish the equivalence property connecting the bi-conditional with conditional: $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \longrightarrow p)$

42) a) Let $f(x, y) = \sin(xy^2) + e^{x3+5y}$ for all ∈ $R^2$. Calculate $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial^2 f}{\partial y \partial x}$ and $\frac{\partial^2 f}{\partial x \partial y}$

**(OR)**

b) A random variable X has the following probability mass function

| | | | | | | |
|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| f(x) | k | 2k | 6k | 5k | 6k | 10k |

Find

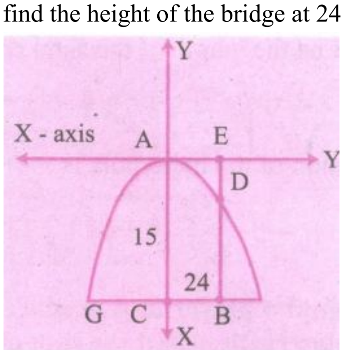
(i) $P(2 < X < 6)$

(ii) $P(2 \leq X < 5)$

(iii) $P(X \leq 4)$

(iv) $P(3 < X)$

43) a) The guides of a railway bridge is a parabola with its vertex at the highest point 15 m above the ends. If the span is 120 m, find the height of the bridge at 24 m from the middle point.




**(OR)**

b) Solve $(1 + x^2)\frac{dy}{dx} = 1 + y^2$

44) a) Find the centre, foci, and eccentricity of the hyperbola $11x^2-25y^2-44x+50y-256 = 0$

**(OR)**

b) Find the acute angle between the curves $y = x^2$ and $x = y^2$ at their points of intersection (0,0), (1,1).

45) a) If $2\cos a = x + \frac{1}{x}$ and $2\cos\beta = y + \frac{1}{y}$, show that

i) $\frac{x}{y} + \frac{y}{x} = 2\cos(\alpha - \beta)$ .

ii) $xy - \frac{1}{xy} = 2i\sin(\alpha + \beta)$

iii) $\frac{x^m}{y^n} - \frac{y^n}{x^m} = 2i\sin(m\alpha - n\beta)$

iv) $x^m y^n + \frac{1}{x^m y^n} = 2\cos(m\alpha + n\beta)$

**(OR)**

b) Prove by vector method that $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

46) a) If $F(\alpha) = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha \\ 0 & 1 & 0 \\ -\sin\alpha & 0 & \cos\alpha \end{bmatrix}$, show that $[F(\alpha)]^{-1} = F(-\alpha)$.

**(OR)**

b) Find a polynomial equation of minimum degree with rational coefficients, having $\sqrt{5} - \sqrt{3}$ as a root.

47) a) Using determinants; find the quadratic defined by $f(x) = ax^2 + bx + c$, if $f(1) = 0$, $f(2) = -2$ and $f(3) = -6$.

**(OR)**

b) Solve $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$

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