Tsi12M

Tenkasi District

Common First Revision Test - January 2025

10-01-25

Standard 12

Time Allowed: 3.00 Hours **MATHEMATICS** Maximum Marks: 90

PART - I

Note: i) All questions are compulsory. **20×1=20**

ii) Choose the correct or most suitable answer from the given four alternatives. Write the option code and the corresponding answer.

1) If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$, then $9I-A =$

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

2) If $x^a y^b = e^m$, $x^c y^d = e^n$, $\Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$, $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$ then the values of x and y are respectively

a) $e(\Delta_2/\Delta_1)$, $e(\Delta_3/\Delta_1)$ b) $\log(\Delta_1/\Delta_3)$, $\log(\Delta_2/\Delta_3)$

c) $\log(\Delta_2/\Delta_1)$, $\log(\Delta_3/\Delta_1)$ d) $e(\Delta_1/\Delta_3)$, $e(\Delta_2/\Delta_3)$

3) If $z = x+iy$ is a complex number such that $|z+2| = |z-2|$ then the locus of z is

a) real axis b) imaginary axis c) ellipse d) circle

4) If $\frac{z-1}{z+1}$ is purely imaginary, then $|z|$ is

a) 1/2 b) 1 c) 2 d) 3

5) The polynomial equation $x^3+2x+3 = 0$ has

a) one negative and two real roots b) one positive and two imaginary roots

c) three real roots d) no solutions

6) If $\sin^{-1}\frac{x}{5} + \text{cosec}^{-1}\frac{5}{4} = \frac{\pi}{2}$, then the value of x is

a) 4 b) 5 c) 2 d) 3

7) The range of $\sec^{-1}x$ is

a) $[0, \pi] \setminus \{\frac{\pi}{2}\}$ b) $[0, \pi]$ c) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ d) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

8) If the two tangents drawn from a point P to the parabola $y^2 = 4x$ are at angles then the locus of P is

a) $2x+1 = 0$ b) $x = -1$ c) $2x-1 = 0$ d) $x = 1$

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) If $\vec{a} = \vec{i} + \vec{j} + \vec{k}$, $\vec{b} = \vec{i} + \vec{j}$, $\vec{c} = \vec{i}$ and $(\vec{a} \times \vec{b}) \times \vec{c} = \lambda\vec{a} + \mu\vec{b}$, then the value of $\lambda+\mu$ is

a) 0 b) 1 c) 6 d) 3

11) The angle between the line $\vec{r} = (-\vec{i} + 2\vec{j} - 3\vec{k}) + t(2\vec{i} + \vec{j} - 2\vec{k})$ and the plane $\vec{r}.(\vec{i} + \vec{j}) + 4 = 0$ is

a) 0° b) 30° c) 45° d) 90°

12) The position of a particle moving along a horizontal line of any time t is given by $s(t) = 3t^2-2t-8$. For what values of t the particle is not moving?

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

13) If $w(x, y) = x^y$, $x>0$, then $\frac{\partial w}{\partial x}$ is equal to

a) $x^y \log x$ b) $y \log x$ c) yx^{y-1} d) $x \log y$

14) The value of $\int_0^{\pi}(\sin x + \cos x)\,dx$

a) 1 b) 2 c) 0 d) 4

15) $\int_0^a \frac{1}{4+x^2}\,dx = \frac{\pi}{8}$ then a is

a) 4 b) 1 c) 3 d) 2

16) P is the amount of certain substance left in after time t. If the rate of evaporation of the substance is proportional to the amount remaining, then (where $k > 0$).

a) $P = Ce^{kt}$ b) $P = Ce^{-kt}$ c) $P = Ckt$ d) $Pt = C$

17) The differential equation of the family of curves $y = Ae^x+Be^{-x}$, where A and B are arbitrary constants is

a) $\frac{d^2y}{dx^2}+y=0$ b) $\frac{d^2y}{dx^2}-y=0$ c) $\frac{dy}{dx}+y=0$ d) $\frac{dy}{dx}-y=0$

18) In the set R of real numbers '*' is defined as follows. Which one of the following is not a binary operation on R?

a) $a*b = \min(a, b)$ b) $a*b = \max(a, b)$

c) $a*b = a$ d) $a*b = a^b$

19) A random variable x has binomial distribution with $n = 25$ and $p = 0.8$ then standard deviation of x is

a) 6 b) 4 c) 3 d) 2

20) If the mean of a binomial distribution is 5 and its variance is 4, then the value of n and p are

a) $\left(\frac{1}{5}, 25\right)$ b) $\left(25, \frac{1}{5}\right)$ c) $\left(25, \frac{4}{5}\right)$ d) $\left(\frac{4}{5}, 25\right)$

PART - II

Note: i) Answer any seven questions. **7×2=14**

ii) Question number 30 is compulsory.

21) If $\operatorname{adj}(A) = \begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$, find A^{-1}.

22) Find the square root of $-6+8i$.

23) State the reason for $\cos^{-1}\left(\cos\left(\frac{-\pi}{6}\right)\right) \neq \frac{\pi}{6}$

24) Obtain the equation of the circle for which (3, 4) and (2, −7) are the ends of a diameter.

25) Find the angle between the straight line $\vec{r} = (2\hat{i} + 3\hat{j} + \hat{k}) + t(\hat{i} - \hat{j} + \hat{k})$ and the plane $2x-y+z = 5$.

26) A particle is fined straight up from the ground to reach a height of s feet in t seconds, when $s = 128t - 16t^2$. Compute the maximum height of the particle reached?

27) If $f(x, y) = x^3-3x^2+y^2+5x+6$, then find f_x at (1, −2).

28) Show that the differential equation for the function $y = e^{-x}+mx+n$, where m and n are arbitrary constants is $e^x\left(\frac{d^2y}{dx^2}\right) - 1 = 0$.

29) Find the mean of the distribution $f(x) = \begin{cases} 3e^{-3x}, & 0 < x < \infty \\ 0, & \text{elsewhere} \end{cases}$

30) Prove that in an algebraic structure the identity element must be unique.

PART - III

Note: i) Answer any seven questions. **7×3=21**

ii) Question number 40 is compulsory.

31) Test for consistency and if possible, solve the system of equation $2x-y+z = 2$, $6x-3y+3z = 6$, $4x-2y+2z = 4$.

32) Solve the equation $2x^3+11x^2-9x-18 = 0$.

33) Show that the points 1, $-\frac{1}{2}+i\frac{\sqrt{3}}{2}$ and $-\frac{1}{2}-i\frac{\sqrt{3}}{2}$ are the vertices of the equilateral triangle.

34) The maximum and minimum distances of the earth from the sun respectively are 152×10^6 km and 94.5×10^6 km. The sun is at one focus of the elliptical orbit. Find the distance from the sun to the other focus.

35) If $\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}$, $\vec{b} = 2\vec{i} - \vec{j} + \vec{k}$, $\vec{c} = 3\vec{i} + 2\vec{j} + \vec{k}$ and $\vec{a}\times(\vec{b}\times\vec{c}) = l\vec{a} + m\vec{b} + n\vec{c}$, find the values of ℓ, m, n.

36) Examine the concavity for the function $f(x) = x^4-4x^3$.

37) A circular plate expands uniformly under the influence of heat. If it's radius increases, from 10.5 cm to 10.75 cm, then find an approximate change in the area and the approximate percentage change in the area.

38) Show that $((p\vee q)\wedge\neg p) \rightarrow q$ is a tautology.

39) A pair of fair dice is roll once. Find the probability mass function to get the number of fours.

40) If $\int_0^\infty e^{-\alpha x^2}x^3dx = 32$, $\alpha > 0$, find α.

PART - IV

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

41) a) If ax^2+bx+c is divided by $x+3$, $x-5$ and $x-1$, the remainders are 21, 61 and 9 respectively. Find a, b and c. (Use Gaussian elimination method)

(OR)

b) If the curves $ax^2+by^2 = 1$ and $cx^2+dy^2 = 1$ intersect each other orthogonally then, show that $\frac{1}{a}-\frac{1}{b}=\frac{1}{c}-\frac{1}{d}$.

42) a) Solve the equation $z^3+8i = 0$, where $z \in \mathbb{C}$.

(OR)

b) Using integration find the area of the region bounded by triangle ABC, whose vertices A, B and C are (−1, 1), (3, 2) and (0, 5) respectively.

43) a) Solve the equation $6x^4-5x^3-38x^2-5x+6 = 0$ if it is known that $\frac{1}{3}$ is a solution.

(OR)

b) If $v(x, y, z) = x^3+y^3+z^3+3xyz$, show that $\frac{\partial^2 v}{\partial y \partial z} = \frac{\partial^2 v}{\partial z \partial y}$.

44) a) Solve $\tan^{-1}2x+\tan^{-1}3x = \frac{\pi}{4}$, if $6x^2 < 1$.

(OR)

b) Verify (i) closure property (ii) commutative property (iii) associative property (iv) existence of identity and (v) existence of inverse for the operation $+_5$ and z_5 using table corresponding to addition modulo 5.

45) a) Find the non-parametric form of water equation and cartesian equations of the plane. $\vec{r} = (6\vec{i}-\vec{j}+\vec{k})+s(-\vec{i}+2\vec{j}+\vec{k})+t(-5\vec{i}-4\vec{j}-5\vec{k})$

(OR)

b) The probability density function of X is given by $f(x) = \begin{cases} Ke^{\frac{-x}{3}} & \text{for } x > 0 \\ 0 & \text{for } x \le 0 \end{cases}$

find (i) The value of K (ii) The distribution function (iii) $P(x<3)$ (iv) $P(5 \le x)$ (v) $P(x \le 4)$.

46) a) At a water fountain, water attains a maximum height of 4m at horizontal distance of 0.5m from its origin. If the path of water is a parabola. Find the height of water at a horizontal distance of 0.75m from the point of origin.

(OR)

SIVAKUMAR M,
Sri Ram Matric HSS
Vallam - 627809.
Tenkasi Dist.

b) Solve: $\left(y-e^{\sin^{-1}x}\right)\frac{dx}{dy}+\sqrt{1-x^2} = 0$

47) a) Prove by vector method, that $\sin(\alpha+\beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$.

(OR)

b) Find the equations of tangent and normal to the ellipse $x^2+4y^2 = 32$ when $\theta = \frac{\pi}{4}$.
