

## Padasalai's Centum Coaching Team - Special Question Paper

STD-XII

MARKS :200

MATHEMATICS

TIME : 3 Hrs

### Section-A

i) All questions are compulsory.

ii) Each question carries one mark.

iii) Choose the most suitable answer from the given four alternatives.

**40X1=40**

1. If  $A = [2 \ 0 \ 1]$ , then rank of  $AA^T$  is (1) 1 (2) 2 (3) 3 (4) 0
2. If A and B are any two matrices such that  $AB = O$  and A is non-singular, then  
(1)  $B = O$  (2) B is singular (3) B is non-singular (4)  $B = A$
3. In a system of 3 linear non-homogeneous equation with three unknowns, if  $\Delta = 0$  and  $\Delta x = 0$ ,  $\Delta y \neq 0$  and  $\Delta z = 0$  then the system has (1) unique solution (2) two solutions (3) infinitely many solutions (4) no solutions
4. The rank of the matrix  $\begin{pmatrix} 7 & -1 \\ 2 & 1 \end{pmatrix}$  is (1) 9 (2) 2 (3) 1 (4) 5
5. The centre and radius of the sphere given by  $x^2 + y^2 + z^2 - 6x + 8y - 10z + 1 = 0$  is  
(1)  $(-3, 4, -5)$ , 49 (2)  $(-6, 8, -10)$ , 1 (3)  $(3, -4, 5)$ , 7 (4)  $(6, -8, 10)$ , 7
6. If a line makes  $45^\circ$ ,  $60^\circ$  with positive direction of axes x and y then the angle it makes with the z axis is  
(1)  $30^\circ$  (2)  $90^\circ$  (3)  $45^\circ$  (4)  $60^\circ$
7. If the projection of  $\vec{a}$  on  $\vec{b}$  and projection of  $\vec{b}$  on  $\vec{a}$  are equal then the angle between  $\vec{a} + \vec{b}$  and  $\vec{a} - \vec{b}$  is  
(1)  $\frac{\pi}{2}$  (2)  $\frac{\pi}{3}$  (3)  $\frac{\pi}{4}$  (4)  $\frac{2\pi}{3}$
8. If  $\vec{p}$ ,  $\vec{q}$  and  $\vec{p} + \vec{q}$  are vectors of magnitude  $\lambda$  then the magnitude of  $|\vec{p} + \vec{q}|$  is  
(1)  $2\lambda$  (2)  $3\lambda$  (3)  $2\lambda$  (4) 1
9. If  $\vec{a}$ ,  $\vec{b}$ ,  $\vec{c}$  are the perpendicular unit vectors then the value of  $|\vec{a} + \vec{b} + \vec{c}|$  is (1) 3 (2) 9 (3)  $3\sqrt{3}$  (4)  $\sqrt{3}$
10. The work done by the force  $\vec{F} = a\vec{i} + \vec{j} + \vec{k}$  in moving the point of application from  $(1, 1, 1)$  to  $(2, 2, 2)$  along a straight line is given to be 5 units. The value of a is (1) -3 (2) 3 (3) 8 (4) -8
11. If z represents a complex number then  $\arg(z) + \arg(\bar{z})$  is (1)  $\frac{\pi}{4}$  (2)  $\frac{\pi}{2}$  (3) 0 (4)  $\frac{2\pi}{3}$
12. The value of  $i + i^{22} + i^{23} + i^{24} + i^{25}$  is (1) i (2) -i (3) 1 (4) -1
13. If  $-i + 3$  is a root of  $x^2 - 6x + k = 0$  then the value of k is (1) 5 (2)  $\sqrt{5}$  (3)  $\sqrt{10}$  (4) 10
14. The value of  $e^{i\theta} + e^{-i\theta}$  is (1)  $2\cos \theta$  (2)  $\cos \theta$  (3)  $2\sin \theta$  (4)  $\sin \theta$
15. The length of the latus rectum of the parabola  $y^2 - 4x + 4y + 8 = 0$  is (1) 8 (2) 6 (3) 4 (4) 2
16. The area of the triangle formed by the tangent at any point on the rectangular hyperbola  $xy = 72$  and its asymptotes is (1) 36 (2) 18 (3) 72 (4) 144
17. The radius of the director circle of the conic  $9x^2 + 16y^2 = 144$  is (1) 7 (2) 4 (3) 3 (4) 5
18. The point of contact of the parabola  $y^2 = 4ax$  and the tangent  $y = mx + c$  is  
(1)  $\left(\frac{a}{m^2}, \frac{2a}{m}\right)$  (2)  $\left(\frac{2a}{m^2}, \frac{a}{m}\right)$  (3)  $\left(\frac{a}{m}, \frac{2a}{m^2}\right)$  (4)  $\left(\frac{-a}{m}, \frac{-2a}{m}\right)$

19. The slope of the tangent to the curve  $y = 3x^2 + 3\sin x$  at  $x = 0$  is (1) 3 (2) 2 (3) 1 (4) -1
20. The value of 'c' of Lagranges Mean Value Theorem for  $f(x) = x$  when  $a = 1$  and  $b = 4$  is  
(1)  $\frac{9}{4}$  (2)  $\frac{3}{2}$  (3)  $\frac{1}{2}$  (4)  $\frac{1}{4}$
21. The least possible perimeter of a rectangle of area  $100\text{m}^2$  is (1) 10 (2) 20 (3) 40 (4) 60
22. The value of  $\lim_{x \rightarrow 0} \frac{x}{\tan x}$  is (1) 1 (2) -1 (3) 0 (4)  $\infty$
23. The curve  $9y^2 = x^2(4 - x^2)$  is symmetrical about (1) y-axis (2) x-axis (3)  $y = x$  (4) both the axes
24. If  $x = r \cos\theta$ ,  $y = r \sin\theta$ , then  $\frac{\partial r}{\partial x}$  is equal to (1)  $\sec\theta$  (2)  $\sin\theta$  (3)  $\cos\theta$  (4)  $\text{cosec}\theta$
25. The area bounded by the line  $y = x$ , the x-axis, the ordinates  $x = 1$ ,  $x = 2$  is (1)  $\frac{3}{2}$  (2)  $\frac{5}{2}$  (3)  $\frac{1}{2}$  (4)  $\frac{7}{2}$
26. The volume generated by rotating the triangle with vertices at (0, 0), (3, 0) and (3, 3) about x-axis is  
(1)  $18\pi$  (2)  $2\pi$  (3)  $36\pi$  (4)  $9\pi$
27. The length of the arc of the curve  $x^{2/3} + y^{2/3} = 4$  is (1) 48 (2) 24 (3) 12 (4) 9
28. If  $f(x)$  is an odd function then the value of  $\int_{-a}^a f(x) dx$  is  
(1)  $2\int_0^a f(x) dx$  (2)  $\int_0^a f(x) dx$  (3) 0 (4)  $\int_0^a f(a-x) dx$
29. The differential equation of all circles with centre at the origin is  
(1)  $x dy + y dx = 0$  (2)  $x dy - y dx = 0$  (3)  $x dx + y dy = 0$  (4)  $x dx - y dy = 0$
30. The integrating factor of  $dx + xdy = e^{-y} \sec^2 y dy$  is (1)  $e^x$  (2)  $e^{-x}$  (3)  $e^y$  (4)  $e^{-y}$
31. The differential equation formed by eliminating A and B from the relation  $y = e^x(A \cos x + B \sin x)$  is  
(1)  $y_2 + y_1 = 0$  (2)  $y_2 - y_1 = 0$  (3)  $y_2 - 2y_1 + 2y = 0$  (4)  $y_2 - 2y_1 - 2y = 0$
32. The order and degree of the different equation  $\frac{dy}{dx} + y = x^2$  is (1) 1,1 (2) 1,2 (3) 2,1 (4) 0,1
33. A monoid becomes a group if it also satisfies the  
(1) closure axiom (2) associative axiom (3) identity axiom (4) inverse axiom
34. In the set of integers with operation \* defined by  $a * b = a + b - ab$ , the value of  $3 * (4 * 5)$  is  
(1) 25 (2) 15 (3) 10 (4) 5
35. If a compound statement is made up of three simple statements, then the number of rows in the truth table is (1) 8 (2) 6 (3) 4 (4) 2
36. The value of  $[3] +_8 [7]$  is (1)  $[10]$  (2)  $[8]$  (3)  $[5]$  (4)  $[2]$
37. Given  $E(X + c) = 8$  and  $E(X - c) = 12$  then the value of c is (1) -2 (2) 4 (3) -4 (4) 2
38. The distribution function  $F(X)$  of a random variable X is  
(1) a decreasing function (2) a non-decreasing function (3) a constant function  
(4) increasing first and then decreasing
39. A random variable X has the following probability distribution
- |         |     |    |    |    |    |     |
|---------|-----|----|----|----|----|-----|
| X       | 0   | 1  | 2  | 3  | 4  | 5   |
| P(X= x) | 1/4 | 2a | 3a | 4a | 5a | 1/4 |
- Then  $P(1 \leq X \leq 4)$  is (1)  $\frac{10}{21}$  (2)  $\frac{2}{7}$  (3)  $\frac{1}{14}$  (4)  $\frac{1}{2}$
40. The mean and variance of the standard normal distribution is (1)  $\mu, \sigma^2$  (2)  $\mu, \sigma$  (3) 0,1 (4) 1,1

**Section-B****i) Answer any ten questions.****ii) Question no.55 is compulsory and choose any nine questions from the remaining. 10X6=60****iii) Each question carries six marks.**

41. Solve by matrix inversion method  $x + y = 3, 2x + 3y = 7$

42. Examine the consistency of the equations  $x + y + z = 7, x + 2y + 3z = 18, y + 2z = 6$   
(by using Rank method)

43. Angle in a semi-circle is a right angle. Prove by vector method.

44. i) If the points  $(\lambda, 0, 3), (1, 3, -1)$  and  $(-5, -3, 7)$  are collinear then find  $\lambda$ .ii) Find the angle between the planes  $2x - y + z = 4$  and  $x + y + 2z = 4$ 45. Find the square root of  $(-8 - 6i)$ 46. Find the equations of the two tangents that can be drawn from the point  $(5, 2)$  to the ellipse  $2x^2 + 7y^2 = 14$ 47. i) Verify Rolle's theorem for the function  $f(x) = x^3 - 3x + 3 ; 0 \leq x \leq 1$ ii) Find the critical numbers of  $x^{3/5} (4 - x)$ 48. Determine the points of inflection if any, of the function  $y = x^3 - 3x + 2$ 49. If  $U = (x - y)(y - z)(z - x)$  then show that  $U_x + U_y + U_z = 0$ 50. Evaluate :  $\int \sin^6 x \, dx$ 51. Solve :  $(D^2 + 6D + 8)y = e^{-2x}$ 52. Construct the truth table for  $(p \vee q) \wedge r$ 

53. i) Prove that the identity element of a group is unique.

ii) Find the order of each element in the group  $G = \{1, \omega, \omega^2\}$ , consisting of cube roots of unity with usual multiplication.

54. The life of army shoes is normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are issued, how many pairs would be expected to need replacement within 12 months.

 **$P(0 \leq Z \leq 2) = 0.4772$** 55. Find the mean and variance of the distribution  $f(x) = \begin{cases} 3e^{-3x}, & 0 < x < \infty \\ 0, & \text{elsewhere} \end{cases}$ **(OR)**For any two complex numbers  $Z_1$  and  $Z_2$  prove that (a)  $|Z_1 Z_2| = |Z_1| \cdot |Z_2|$  (b)  $\arg(Z_1 \cdot Z_2) = \arg Z_1 + \arg Z_2$ **Section-C****i) Answer any ten questions.****ii) Question no.70 is compulsory and choose any nine questions from the remaining. 10X10=100****iii) Each question carries ten marks.**56. Solve the following system of linear equations by determinant method.  $x + y + 2z = 6, 3x + y - z = 2, 4x + 2y + z = 8$

57. Prove that  $\sin (A - B) = \sin A \cos B - \cos A \sin B$ .
58. Derive the equation of the plane in the intercept form.(both Vector and Cartesian forms)
59. Solve the equation  $x^9 + x^5 - x^4 - 1 = 0$
60. Find the eccentricity, centre, foci and vertices of the hyperbola  $9x^2 - 16y^2 - 18x - 64y - 199 = 0$  and also trace the curve.
61. Show that the line  $x - y + 4 = 0$  is a tangent to the ellipse  $x^2 + 3y^2 = 12$ . Find the co-ordinates of the point of contact.
62. Show that the equation of the normal to the curve  $x = a \cos^3 \theta$  ;  $y = a \sin^3 \theta$  at ' $\theta$ ' is  $x \cos \theta - y \sin \theta = a \cos 2\theta$ .
63. Show that the volume of the largest right circular cone that can be inscribed in a sphere of radius  $a$  is  $\frac{8}{27}$  (volume of the sphere).
64. Trace the curve  $y = x^3$
65. Find the common area enclosed by the parabolas  $y^2 = x$  and  $x^2 = y$
66. Show that the equation of the curve whose slope at any point is equal to  $y + 2x$  and which passes through the origin is  $y = 2(e^x - x - 1)$
67. The rate at which the population of a city increases at any time is proportional to the population at that time. If there were 1,30,000 people in the city in 1960 and 1,60,000 in 1990 what population may be anticipated in 2020.  $\log_e \left( \frac{16}{13} \right) = 0.2070$  ;  $e^{0.42} = 1.52$
68. Show that the set  $G = \{ 2^n / n \in G \}$  is an abelian group under multiplication.
69. The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers find approximately the number of drivers with (i) no accident in a year (ii) more than 3 accidents in a year [ $e^{-3} = 0.0498$ ].
70. A cable of a suspension bridge hangs in the form of a parabola when the load is uniformly distributed horizontally. The distance between two towers is 1500 ft, the points of support of the cable on the towers are 200ft above the road way and the lowest point on the cable is 70ft above the roadway. Find the vertical distance to the cable (parallel to the roadway) from a pole whose height is 122 ft.

(OR)

Find the perimeter of the circle with radius  $a$ .

## மாணவர்கள் செய்ய வேண்டியது என்ன?

1. [Click Here & Enter Your Details \(Students Only\)](#)
2. நமது பாடசாலை வலைதளத்தில் வழங்கப்படும் சிறப்பு வினாத்தாளை பிரிண்ட் எடுத்து விடுமுறை நாட்களில் முழுமையான, முறையான தேர்வு எழுதி வினாத்தாள் தயாரித்து வழங்கிய ஆசிரியருக்கு அனுப்பி வைக்க வேண்டும்.
3. A4 Size (Or) Legal Size உள்ள துணிக்கவர்கள் இரண்டு வாங்கிக்கொள்ள வேண்டும். ஒரு தாளில் வினாத்தாள் தயாரித்த ஆசிரியர் முகவரியை "பெறுநர்" பகுதியில் குறிப்பிட்டு அதில் தங்கள் விடைத்தாளை வைக்க வேண்டும்.
4. மற்றோரு கவரில் மாணவர்கள் தங்கள் சுயமுகவரியை "பெறுநர்" எனும் இடத்தில் எழுதி அதற்கு தேவையான அளவில் ஸ்டாம்ப்களையும் ஒட்டிய பிறகு, அக்கவரையும் விடைத்தாள் எழுதி அனுப்பும் கவருக்குள்ளேயே வைத்து அனுப்ப வேண்டும்.
5. ஒன்றுக்கும் மேற்பட்ட மாணவர்கள் இணைந்து விடைத்தாளை அனுப்பினால் மொத்தமாக ஒரே கவரில் அனுப்பலாம்.
6. ஆசிரியர்கள் தங்கள் விடைத்தாளை திருத்திய பிறகு தங்கள் சுயவிவரம் கவரில் வைத்து தங்களுக்கு விரைவில் திருப்பி அனுப்புவார்.
7. Slow Learners மீது மட்டும் கவனம் செலுத்தாமல் மீத்திறன் மிகுந்த மாணவர்களுக்கும் உதவும் நோக்கில், மாணவர்களின் நலன் கருதி, இச்சேவையில் தங்களை இணைத்துக்கொண்டுள்ள பாடசாலை ஆசிரியர் குழுவினை, மாணவர்கள் மிகுந்த பணிவுடன் தொடர்பு கொண்டு திருத்தப்பட்ட விடைத்தாள் குறித்த தங்கள் சந்தேகங்களையும், ஆலோசனைகளையும் அலைபேசி மூலமாக பெறலாம்.

## இவ்வினாத்தாளுக்கான விடைகளை எழுதி அனுப்ப வேண்டிய முகவரி-

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