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PATTUKKOTTAI PALANIAPPAN MATHS

PRE HALFYEARLY EXAM -2019

12th Standard

Date : 27-Nov-19

MATHS

Reg.No. :

Exam Time : 03:00:00 Hrs

Total Marks : 90

P.A.PALANIAPPAN,MSc.,MPhil.,BEd

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PART-I

20 x 1 = 20

Answer All the Questions

1) If $(AB)^{-1} = \begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$, then B^{-1} =

(a) $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

2) If ρ(A) = ρ([A | B]), then the system AX = B of linear equations is

(a) consistent and has a unique solution (b) consistent solution (c) consistent and has infinitely many (d) inconsistent

3) If $\left|z - \frac{3}{z}\right| = 2$ then the least value |z| is

(a) 1 (b) 2 (c) 3 (d) 5

4) The principal argument of $(\sin 40°+i \cos 40°)^5$ is

(a) −110° (b) −70° (c) 70° (d) 110°

5) The number of real numbers in [0,2π] satisfying $\sin^4 x - 2\sin^2 x + 1$ is

(a) 2 (b) 4 (c) 1 (d) ∞

6) If $\sin^{-1} x+\sin^{-1} y+\sin^{-1} z=\frac{3\pi}{2}$, the value of $x^{2017}+y^{2018}+z^{2019} - \frac{9}{x^{101}+y^{101}+z^{101}}$ is

(a) 0 (b) 1 (c) 2 (d) 3

7) If x+y=k is a normal to the parabola y^2 =12x, then the value of k is

(a) 3 (b) -1 (c) 1 (d) 9

8) In an ellipse, the distance between its foci is 6 and its minor axis is 8, then e is

(a) $\frac{4}{5}$ (b) $\frac{1}{\sqrt{52}}$ (c) $\frac{3}{5}$ (d) $\frac{1}{2}$

9) If $\vec{a}$ and $\vec{b}$ are unit vectors such that $[\vec{a}, \vec{b}, \vec{a} \times \vec{b}] = \frac{\pi}{4}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

10) The two planes 3x + 3y - 3z - 1 = 0 and x + y - z + 5 = 0 are

(a) mutually perpendicular (b) parallel (c) inclined at 45° (d) inclined at 30

11) The tangent to the curve y^2 - xy + 9 = 0 is vertical when

(a) y = 0 (b) $y = \pm\sqrt{3}$ (c) $y = \frac{1}{2}$ (d) $y = \pm 3$

12) The curve y= $ax^4 + bx^2$ with ab > 0

(a) has, no horizontal tangent (b) is concave up (c) isconeavedown (d) has no points of inflection

13) If w (x, y) = xy, 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 $\frac{(n+2)}{(n)} = 90$ then n is

(a) 10 (b) 5 (c) 8 (d) 9

15) For any value of n∈Z, $\int_0^{\pi} ecos^{2x} cos^3[(2n+1)x]$ is

(a) $\frac{\pi}{2}$ (b) π (c) 0 (d) 2

16) 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

17) The solution of $\frac{dy}{dx}=2^{y-x}$ is

(a) 2^x+2^y=C (b) 2^x-2^y=C (c) $\frac{1}{2^x}-\frac{1}{2^y}=C$ (d) x+y=C

18) A pair of dice numbered 1, 2, 3, 4, 5, 6 of a six-sided die and 1, 2, 3, 4 of a four-sided die is roUed and the sum is determined. Let the random variable X denote this sum. Then the number of elements in the inverse image of 7 is

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

19) If P{X = 0} = 1- P{X = I}. IfE[X) = 3Var(X), then P{X = 0}.

(a) $\frac{2}{3}$ (b) $\frac{2}{5}$ (c) $\frac{1}{5}$ (d) $\frac{1}{3}$

20) Which one of the following is incorrect? For any two propositions p and q, we have

(a) ¬ (p∨q) ≡ ¬ p ∧ ¬q (b) ¬ (p∧ q)≡¬p ∨ ¬q (c) ¬ (p ∨ q)≡¬p∨¬q (d) ¬(¬p)≡ p

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PART-II

7 x 2 = 14

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Note: i)Answer any 7 questions only

ii)Question No.30 compulsary

21) Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal

22) If y=4x+c is a tangent to the circle $x^2+y^2=9$, find c .

23) If $\vec{a},\vec{b},\vec{c}$ are three vectors, prove that $[\vec{a}+\vec{c},\vec{a}+\vec{b},\vec{a}+\vec{b}+\vec{c}]$ = $[\vec{a},\vec{b},\vec{c}]$

24) The probability density function of X is given by $f(x)=\begin{cases} kxe^{-2x} & for x>0 \\ 0 \quad for & x\le 0\end{cases}$ Find the value opf .

25) 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.

26) Show that the equation $z^2=\bar{z}$ has four solutions.

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

28) A person learnt 100 words for an English test. The number of words the person remembers in t days after learning is given by $W(t)=100\times(1-0.1t)^2$, $0\le t\le 10$. What is the rate at which the person forgets the words 2 days after learning?

29) Evaluate: $\int_{-log2}^{log2} e^{-|x|}$ dx.

30) Find the differential equation of the family of circles passing through the points (a,0) and (−a,0).

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PART-III

7 x 3 = 21

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Note: i)Answer any 7 questions only

ii)Question No.40 compulsary

31) Find the rank of the following matrices by row reduction method:

$$\begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 2 \\ 1 & -2 & 3 \\ 1 & -1 & 1 \end{bmatrix}$$

32) If p and q are the roots of the equation $lx^2+nx+n = 0$, show that $\sqrt{\frac{p}{q}}+\sqrt{\frac{q}{p}}+\sqrt{\frac{n}{l}}=0$.

33) If the normal at the point ' t_1 ' on the parabola $y^2 = 4ax$ meets the parabola again at the point' t_2 ', then prove that $t_2=-\left(t_1\frac{2}{t_1}\right)$

34) Let $U(x, y, z) = x^2 - xy + 3 \sin z$, $x, y, z \in R$ Find the linear approximation for U at (2,−1,0).

35) If $\omega \neq 1$ is a cube root of unity, then the show that $\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2}+\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}=1$

36) Using mean value theorem prove that for, a > 0, b > 0, $|e^{-a} - e^{-b}| < |a - b|$.

37) Show that the differential equation representing the family of curves $y^2 = 2a\left(x+a^{\frac{2}{3}}\right)$where a is a positive parameter, is $\left(y^2-2xy\frac{2}{3}\right)^3=8\left(y\frac{dy}{dx}\right)^5$.

38) If μ and σ^2 are the mean and variance of the discrete random variable X, and E(X + 3)=10 and $E(X + 3)^2 = 116$, find μ and a^2•

39) A variable plane moves in such a way that the sum of the reciprocals of its intercepts on the coordinate axes is a constant. Show that the plane passes through a fixed point

40) Evaluate $\int_0^{\frac{\pi}{2}}\begin{vmatrix} cos^4x & 7 \\ sin^5x & 3\end{vmatrix}$ dx

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PART-IV 7 x 5 = 35

Answer All the Questions

41) a) If $z_1,z_2,$ and z_3 are three complex numbers such that $|z_1|=1,|z_2|=2|z_3|=3$ and $|z_1+z_2+z_3|=1$,show that $|9z_1z_2+4z_1z_2+z_2z_3|=6$

(OR)

b) If A = $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$, find the productsAB and BAand hence solve the system of equations x - y + z = 4, x - 2y - 2z = 9, 2x + y + 3z = 1.

42) a) Solve: (2x-1)(x+3)(x-2)(2x+3)+20=0

(OR)

b) Find the number of solution of the equation $\tan^{-1}(x-1)\tan^{-1}x+\tan^{-1}(x+1)\tan^{-1}(3x)$

43) a) At a water fountain, water attains a maximum height of 4m at horizontal distance of 0 5 . m 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)

b) By vector method, prove that cos(α + β) = cos α cos β - sin α sin β

44) a) The volume of a cylinder is given by the formula $V = \pi r^2 h$. Find the greatest and least values of V if r + h = 6.

(OR)

b) If w(x,y, z) = log $\left(\frac{5x^3y^4+7y^2xz^4-75y^3z^4}{x^2+y^2}\right)$ find $x\frac{\partial w}{\partial x}+y\frac{\partial w}{\partial y}+z\frac{\partial w}{\partial z}$

45) a) A watermelon has an ellipsoid shape which can be obtained by revolving an ellipse with major-axis 20 cm and minor-axis 10 cm about its major-axis. Find its volume using integration.

(OR)

b) A tank contains 1000 litres of water in which 100 grams of salt is dissolved. Brine (Brine is a high-concentration solution of salt (usually sodium chloride) in water) runs in a rate of 10 litres per minute, and each litre contains 5grams of dissolved salt. The mixture of the tank is kept uniform by stirring. Brine runs out at 10 litres per minute. Find the amount of salt at any time t.

46) a) Verify

(i) closure property,

(ii) commutative property,

(iii) associative property,

(iv) existence of identity, and

(v) existence of inverse for the operation $+_5$ on Z_5 using table corresponding to addition modulo 5.

(OR)

b) On the average, 20% of the products manufactured by ABC Company are found to be defective. If we select 6 of these products at random and X denote the number of defective products find the probability that (i) two products are defective (ii) at most one product is defective (iii) at least two products are defective.

47) a) Find the non-parametric form of vector equation of the plane passing through the point (1, −2, 4) and perpendicular to the plane x + 2y −3z = 11 and parallel to the line $\frac{x+7}{3} = \frac{y+3}{-1} = \frac{z}{1}$

(OR)

b) Find the acute angle between $y = x^2$ and $y = (x - 3)^2$.

"ALL THE BEST"

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Correction :Q.No.33
Q.No.42b