MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER -12 (UNSOLVED)

Part I

1. If $\rho(A) \neq \rho([A \mid B])$, then the system is ....

A. consistent and has infinitely many solution

B. consistent and has unique solution

C. consistent

D. inconsistent

Answer: D

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2. The principal argument of $(\sin 40^\circ + i\cos 40^\circ)^5$ is

A. -110°

B. -70°

C. 70°

D. 110°

Answer: A

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3. Find the fourth roots of unity.

A. $1 \pm i, \ -1 \pm i$

B. $\pm i, 1 \pm i$

C. $\pm 1, \ \pm i$

D. 1,-1

Answer: D

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4. If α, β and γ are the zeros of $x^3 + px^2 + qx + r$, then $\Sigma \frac{1}{\alpha}$ is

A. $-\frac{q}{r}$

B. $-\frac{p}{r}$

C. $\frac{q}{r}$

D. $-\frac{q}{p}$

Answer: A

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5. If the function $f(x) = \sin^{-1}(x^2 - 3)$ then x belongs to

A. [-1,1]

B. $[\sqrt{2}, 2]$

C. $[-2, -\sqrt{2}] \cup [\sqrt{2}, 2]$

D. $[-2, -\sqrt{2}] \cap [\sqrt{2}, 2]$

Answer: C

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6. $\sin^{-1} x - \cos^{-1}(-x)$ =..........

A. $\frac{-\pi}{2}$

B. $\frac{\pi}{2}$

C. $\frac{-3\pi}{2}$

D. $\frac{3\pi}{2}$

Answer: A

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7. The ellipse $E_1 : \frac{x^2}{9} + \frac{y^2}{4}$ =1 is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point (0,4) circumscribes the rectangle R. The eccentricity of the ellispe is

A. $\frac{\sqrt{2}}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

Answer: C

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8. The eccentricity of the hyperbola $\frac{y^2}{9} - \frac{x^2}{25} = 1$ is ....

A. $\frac{34}{3}$

B. $\frac{5}{3}$

C. $\frac{\sqrt{34}}{3}$

D. $\frac{\sqrt{34}}{5}$

Answer: C

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9. If the area of the parallelogram having diagonals $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}, \ \vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$ is :

A. $10\sqrt{3}$

B. $6\sqrt{30}$

C. $\frac{3}{2}\sqrt{30}$

D. $3\sqrt{30}$

Answer: D

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10. The function $\sin^4 x + \cos^4 x$ is increasing in the interval

A. $\left[\frac{5\pi}{8}, \frac{3\pi}{4}\right]$

B. $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[0, \frac{\pi}{4}\right]$

Answer: C

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11. The function $f(x) = x^3$ is ....

A. increasing

B. decreasing

C. strictly decreasing

D. strictly increasing

Answer: D

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12. If $g(x, y) = 3x^2 - 5y + 2y^2$, $x(t) = e^t$ and $y(t) = \cos t$, then $\frac{dg}{dt}$ is equal to

A. $6e^{2t} + 5\sin t - 4\cos t \sin t$

B. $6e^{2t} - 5\sin t + 4\cos t \sin t$

C. $3e^{2t} + 5\sin t + 4\cos t \sin t$

D. $3e^{2t} - 5\sin t + 4\cos t \sin t$

Answer: A

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13. For the function $y = x^3 + 2x^2$ the value of dy when x=2 and dx=0.1 is ....

A. 1

B. 2

C. 3

D. 4

Answer: B

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14. The value of $\int_0^0 \left(\sqrt{a^2 - x^2}\right)^3 dx$ is ....

A. $\frac{\pi a^3}{16}$

B. $\frac{3\pi a^4}{16}$

C. $\frac{3\pi a^2}{8}$

D. $\frac{3\pi a^4}{8}$

Answer: B

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15. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax+3}{2y+f}$ represents a circle , then the value of a is :

A. 2

B. -2

C. 1

D. -1

Answer: B

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16. The solution of $\frac{dy}{dx}+p(x)y=0$ is

A. $y=ce^{\int Pdx}$

B. $y=ce^{-\int Pdx}$

C. $x=ce^{-\int Pdy}$

D. $x=ce^{\int Pdy}$

Answer: B

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17. 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

Answer: D

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18. A computer salesperson knows from his past experience that he sells computers to one in every twenty customers who enter the showroom. What is the probability that he will sell a computer to exactly two of the next three customers?

A. $\frac{57}{20^3}$

B. $\frac{57}{20^2}$

C. $\frac{19^3}{20^3}$

D. $\frac{57}{20}$

Answer: A

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19. The truth table for $(p \wedge q) \vee \; - q$ is given below:

p	q	$(p \wedge q) \vee (\neg q)$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which of the following is true?

A. $\begin{array}{ccccc} & (a) & (b) & (c) & (d) \\ (1) & T & T & T & T \end{array}$

B. $\begin{array}{ccccc} & (a) & (b) & (c) & (d) \\ (2) & T & F & T & T \end{array}$

C. $\begin{array}{ccccc} & (a) & (b) & (c) & (d) \\ (3) & T & T & F & T \end{array}$

D. $\begin{array}{ccccc} & (a) & (b) & (c) & (d) \\ (4) & T & F & F & F \end{array}$

Answer: C

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Part Ii

1. Find the rank of each of the following matrices: $\begin{bmatrix} 3 & 2 & 5 \\ 1 & 1 & 2 \\ 3 & 3 & 6 \end{bmatrix}$

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2. Simplify the following:

$i\, i^2 i^3 \ldots\ldots i^{2000}$

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3. Find the equation of the parabola. Focus (4,0) and directrix x=-4.

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4. A plane passes through the point $(1, 1, 2)$ - and the normal to the plane of magnitude $3\sqrt{3}$ makes equal acute angles with the coordinate axes. Find the equation of the plane.

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5. If the volume of a cube of side length x is $V = x^3$. Find the rate of change of the volume with respect to x when x = 5 units.

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6. Use linear approximation to find an approximate value of $\sqrt{9.2}$ without using a calculator.

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7. Evaluate the following :

$$\int_0^{\frac{\pi}{4}} \sin^6 2x dx$$

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8. Find the differential equation for the family of all straight lines passing through the origin

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9. $f(x) = \begin{cases} \frac{A}{x} & 1 < x < e^3 \\ 0 & \text{elsewhere} \end{cases}$ is a probability density function of a continuous random of X, find $P(x > e)$

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10. Let $A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ be any two bollean matrices of the same type find $A \vee B \text{ and } A \wedge B$

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Part Iii

1. Show that the points represented by the complex numbers $7 + 9i$, $-3 + 7i, 3 + 3i$ from a right angled triangle on the Argand diagram.

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2. Provet that a stralght line and parabola connot intersect at more than two points.

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3. Find the value of $\cos\left(\cos^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{4}{5}\right)\right)$

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4. Determine whether the points (-2,1) ,(0,0) and (-4,-3) lie outside, on or inside the circle $x^2+y^2-5x+2y-5=0$

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5. Prove that $\left[\vec{a}\times\vec{b},\vec{b}\times\vec{c},\vec{c}\times\vec{a}\right]=\left[\vec{a},\vec{b},\vec{c}\right]^2$

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6. Find the intervals of monotonicity and local extrema of the function $f(x)=x\log x+3x$

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7. If $u(x, y) = \frac{x^2 + y^2}{\sqrt{x + y}}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{3}{2}u.$

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8. Four defective oranges are accidentally mixed with sixteen good ones. Two oranges are drawn at random from the mixed lot. If the random variable 'X' denotes the number of defective oranges, then find the values of 'X' and number of points in its inverse image.

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9. Show that $\neg(p \wedge q) \equiv ((\neg p) \vee (\neg q))$

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10. Find the rank of each of the following matrices: (i) $\begin{bmatrix} 3 & 2 & 5 \\ 1 & 1 & 2 \\ 3 & 3 & 6 \end{bmatrix}$ (ii) $\begin{bmatrix} 4 & 3 & 1 & -2 \\ -3 & -1 & -2 & 4 \\ 6 & 7 & -1 & 2 \end{bmatrix}$

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11. In a T20 match, Chennai Super Kings needed just 6 runs to win with 1 ball left to go in the last over. The last ball was bowled and the batsman at the crease hit it high up. The ball traversed along a path in a vertical plane and the equation of the path is $y = ax^2 + bx + c$ with respect to a xy -coordinate system in the vertical plane and the ball traversed through the points (10,8),(20,16),(40,22), can you conclude that Chennai Super Kings won the match?

Justify your answer. (All distances are measured in metres and the meeting point of the plane of the path with the farthest boundary line is (70,0).)

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12. Prove that

$$(1+\cos\theta+i\sin\theta)^n+(1+\cos\theta-i\sin\theta)^n=2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cos\left(\frac{n\theta}{2}\right)$$

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13. Solve $(x-4)(x+2)(x+3)(x-3)+8=0$

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14. Prove thate

$$\tan^{-1}\left(\frac{2}{11}\right)+\tan^{-1}\left(\frac{7}{24}\right)=\tan^{-1}\left(\frac{1}{2}\right)$$

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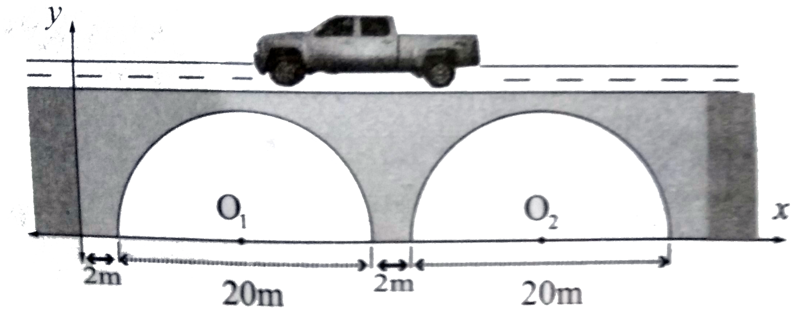
15. A road bridge over an irrigation canal have two semi circular vents each with a span of 20 m and the supporting pillars of width 2m. Use figure to write the equations that represent the semi verticular vents.



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16. Show that the set $G = \{a + b\sqrt{2} / a, b \in Q\}$ is an infinite abelian group with respect to Binary operation addition. Satisfies closure, associative, identity and inverse properties.

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17. Find the parametric form of vector equation, and Cartesian equations of the plane containing the line $\vec{r}\left(\hat{i} - \hat{j} + 3\hat{k}\right) + t\left(2\hat{i} - \hat{j} + 4\hat{k}\right)$ and perpendicular to the plane $\vec{r}.\left(\hat{i} + 2\hat{j} + \hat{k}\right) = 8.$

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18. The mean and standard deviation of a binomial variate X are respectively 6 and 2. Find (i) the probability mass function (ii) P(X=3) (iii) $P(X \geq 2)$.

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19. Find the intervals of concavity and the points of inflection of the function. $y = 12x^2 - 2x^3 - x^4$

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20. For each of the functions find the $f_x, f_y,$ and show that $f_{xy} = f_{yx}$.

$f(x, y) = \tan^{-1}\left(\frac{x}{y}\right)$

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21. $\frac{dy}{dx}+\frac{y}{x}=\sin x$

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22. Evaluate: $\int_{\pi/6}^{\pi/3}\frac{dx}{1+\sqrt{\cot x}}$

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