MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER -13

Part I Choose The Correct Answer Answer All The Question

1. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and A(adj A) = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then k=.....

A. 0

B. $\sin\theta$

C. $\cos\theta$

D. 1

Answer: D

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2. In the system of liner equations with 3 unknowns if $\rho(A) = \rho([A \mid B]) = 1$, the system has .....

A. has unique solution

B. reduces to 2 equations and has infinitely many solution

C. reduces to a single equation and has infinitely many solution

D. is inconsistent

Answer: C

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3. If $|z-2+i| \leq 2$, then the greatest value of $|z|$ is

A. $\sqrt{3}-2$

B. $\sqrt{3}+2$

C. $\sqrt{5}-2$

D. $\sqrt{5}+2$

Answer: D

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4. The value of $z\bar{z}$ is.....

A. $|z|$

B. $|z|^2$

C. $2|z|$

D. $2|z|^2$

Answer: B

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5. A zero of $x^3 + 64$is

A. 0

B. 4

C. 4i

D. -4

Answer: D

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6. If $\sin^{-1} x + \cot^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}$, then x is equalt to

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

B. $\frac{1}{\sqrt{5}}$

C. $\frac{2}{\sqrt{5}}$

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

Answer: B

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7. $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)$ is equal to

A. $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$

B. $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$

C. $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$

D. $\tan^{-1}\left(\frac{1}{2}\right)$

Answer: D

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8. Let C be the circle with centre at (1,1) and radius =1 . If T is the circle centered at (0,y) passing through the origin and touching the circle C externally. Then the radius of T is equal to

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

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

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

D. $\frac{1}{4}$

Answer: D

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9. Sum of the focal distance of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. $\left(\frac{b^2}{c}, \frac{a^2 m}{c}\right)$

B. $\left(-\frac{a^2 m}{c}, \frac{b^2}{c}\right)$

C. $\left(\frac{a^2 m}{c}, -\frac{b^2}{c}\right)$

D. $\left(\frac{-a^2 m}{c}, -\frac{b^2}{c}\right)$

Answer: B

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10. If $\bar{a} = 2\hat{i} + 3\hat{j} - \hat{k}, \bar{b} = \hat{i} + 2\hat{j} - 5\hat{j}, \bar{c} = 3\hat{i} + 5\hat{j} - \hat{k}$, then a vector perpendicular to $\bar{a}$ and lies in the plane containing $\bar{b}$ and $\bar{c}$ is.....

A. $-17\hat{i} + 21\hat{j} - 97\hat{k}$

B. $-17\hat{i} + 21\hat{j} - 122\hat{k}$

C. $-17\hat{i} - 21\hat{j} + 97\hat{k}$

D. $-17\hat{i} - 21\hat{j} - 97\hat{k}$

Answer: D

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11. One of the closed points on the curve $x^2 - y^2 = 4$ to the point (6,0) is.....

A. (2,0)

B. $(\sqrt{5}, 1)$

C. $(3, \sqrt{5})$

D. $(\sqrt{13}, -\sqrt{3})$

Answer: C

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12. If $f(x) = \frac{x}{x+1}$, then its differential is given by

A. $-\frac{1}{(x+1)^2}dx$

B. $\frac{1}{(x+1)^2}dx$

C. $\frac{1}{x+1}$dx

D. $-\frac{1}{x+1}$ dx

Answer: B

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13. The curve $y^2 = (x-1)(x-2)^2$ has.....

A. as asymptote x=1

B. an asymptote x=2

C. two asymptote x=1 and x=2

D. no asymptote

Answer: D

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14. If $\int_0^x f(t)dt = x + \int_x^1 tf(t)dt$, then the value of f(1) is

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

B. 2

C. 1

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

Answer: A

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15. The number of arbitrary constants in the general solutions of order n and $n+1$ are respectively

A. n-1, n

B. n,n+1

C. n+1, n+2

D. n+1, n

Answer: B

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16. The degree of the differential equation

$$y(x) = 1 + \frac{dy}{dx} + \frac{1}{1.2}\left(\frac{dy}{dx}\right)^2 + \frac{1}{1.2.3}\left(\frac{dy}{dx}\right)^3 + \ldots$$

is

A. 2

B. 3

C. 1

D. 4

Answer: C

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17. Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed n times. Then the possible values of X are

A. I + 2n, i=1,2....n

B. 2i-n, i=0,1,2....n

C. n-I, i=0,1,2.....n

D. 2i + 2n,i=0,1,2,.....n

Answer: B

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18. A random variable X has binominal 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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19. In the last column of the truth table for $\sim(p \vee \sim q)$ the number of final outcomes of the truth value 'F' are

A. 1

B. 2

C. 3

D. 4

Answer: C

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20. Mean and variance of binomial distribution are.

A. nq, npq

B. np, $\sqrt{npq}$

C. np,np

D. np, npq

Answer: D

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21. Find the modulus and principal argument of $(1+i)$ and hence express it in the polar form.

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Part Ii Ii Answer Any Seven Questions Question No 30 Is Compulsory

1. If α, β, γ and δ are the roots of the polynomial eqauation $2x^4 + 5x^3 - 7x^2 - 8 = 0$, find a quadratic equation with integer corddicients whose roots are $\alpha + \beta + \gamma + \delta$ and $\alpha\beta\gamma\delta$.

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2. Find the value of the expression in terms of x, with the help of a reference triangle.

$\cos\left(\tan^{-1}(3x - 1)\right)$

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3. For what value of x the tangent of the curve $y = x^3 - 3x^2 + x - 2$ is parallel to the line $y = x$

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4. Find a linear approximation for the following function at the indicated points.

$$h(x) = \frac{x}{x+1}, x_0 = 1$$

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5. Answer the equation:

$$\int \frac{1}{x + \sqrt{x}} dx$$

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6. Form the differential equation by eliminating the arbitrary constants A and B from

$y = A\cos x + B\sin x$

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7. For the probability density function $f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & x \leq 0 \end{cases}$ find F(2)

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8. Verify the

Closure property

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9. Find the rank of the matrix $\begin{bmatrix} 2 & -2 & 4 & -3 \\ -3 & 4 & -2 & -1 \\ 6 & 2 & -1 & 7 \end{bmatrix}$

by reducing it to an echelon form.

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Part Iii Iii Answer Any Seven Questions Question No 40 Is Compulsory

1. Find the rank of the following matrices by row reduction method:

(i) $\begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & -1 & 3 & 4 \\ 5 & -1 & 7 & 11 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 2 \\ 1 & -2 & 3 \\ 1 & -1 & 1 \end{bmatrix}$

(iii) $\begin{bmatrix} 3 & -8 & 5 & 2 \\ 2 & -5 & 1 & 4 \\ -1 & 2 & 3 & -2 \end{bmatrix}$

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2. If $\omega \neq 1$ is a cube root of unity, show that the roots of the equation $(z-1)^3 + 8 = 0$ are $-1, 1-2\omega, 1-2\omega^2$.

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3. Form a polynomial equation with integer coefficients with $\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ as a root.

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4. Find the value of $\sec^2\left(\cot^{-1} 3\right) + \operatorname{cosec}^2\left(\tan^{-1} 2\right)$

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5. Find the equation of the ellipse whose eccentricity is $\frac{1}{2}$, one of the foci is (2, 3) and a directrix is x = 7. Also find the length of the major and minor axes of the ellipse.

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6. Expand $\sin x$ in ascending powers $x - \frac{\pi}{4}$ upto three non-zero terms.

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7. The radius of a circular plate is measured as 12.65 cm instead of the actual length 12.5 cm. Find the following is calculating the area of the circular plate:

(i) Absolute error

(ii) Relative error

(iii) Percentage error

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8. Evaluate $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}$ dx

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9. The I.E. of $\left(1+y^2\right)dx = \left(\tan^{-1} y - x\right)dy$ is _____.

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10. If $\hat{a}, \hat{b}, \hat{c}$ are three unit vectors such that $\hat{b}$ and $\hat{c}$ are non-parallel and $\hat{a} \times \left(\hat{b} \times \hat{c}\right) = \frac{1}{2}\hat{b}$, find the angle between $\vec{a}$ and $\vec{c}$.

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11. A six sided die is marked '1' on one face, '3' on two of its faces, and '5' on remaining three faces. The die is thrown twice. If X denotes the total score in two throws, find

the probability mass function

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12. Find the value of $\sec^2\left(\cot^{-1} 3\right) + \operatorname{cosec}^2\left(\tan^{-1} 2\right)$

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13. Let $M = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} : x \in R - \{0\} \right\}$ and let * be the matrix multiplication. Determine whether M is closed under *. If so, examine the existence of identify, existence of inverse properties for the operation * on M.

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14. Gravel is being duped from a conveyor belt at a rate of $30 ft^3 / \min$ and its coarsened such that it from a sile in the shape of a cone whose base diameter and height are always equal . How fast is the height of the pile increasing when the pile is 10 ft high ?

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15. Evaluate as the limit of sums: $\int_1^2 \left(x^2 - 1\right) dx$

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Part Iv Iv Answer All The Questions

1. 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.)

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2. Find the foci, vertices and length of major and minor axis of the conic

$4x^2 + 36y^2 + 40x - 288y + 532 = 0.$

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3. The growth of a population is proportional to the number present. If the population of a colony doubles in 50 years, in how many years will the population become triple?

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4. Find the equation of the curve passing through (1,0) and which has slope $1 + \frac{y}{x}$ at (x,y)

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5. If z = x + iy and $\arg\left(\frac{z-i}{z+2}\right) = \frac{\pi}{4}$. Show that $x^2 + y^2 + 3x - 3y + 2 = 0$.

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6. Evaluate the following :

$$\int_0^{\frac{\pi}{2}} \frac{e^{-\tan x}}{\cos^6 x} dx$$

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7. Find the parametric form of vector equation of a straight line passing through the point of intersection of the straight lines $\vec{r} = \left(\hat{i} + 3\hat{j} - \hat{k}\right) + t\left(2\hat{i} + 3\hat{j} + 2\hat{k}\right)$ and $\frac{x-2}{1} = \frac{y-4}{2} = \frac{z+3}{4}$ and perpendicular to both straight lines.

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8. Solve $\left(\sqrt{3}+\sqrt{2}\right)^x + \left(\sqrt{3}-\sqrt{2}\right)^x = 10$

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9. If $u(x, y) = x^2y + 3xy^4$, $x = e^t$ and y= sin t, find $\frac{du}{dx}$ and evaluate it at t=0.

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