MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 5

Part I

1. If $A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|adj(AB)|=$

A. -40

B. -80

C. -60

D. -20

Answer: B

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2. $i^n + i^{n+1} + i^{n+2} + i^{n+3}$

A. 0

B. 1

C. -1

D. i

Answer: A

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3. If $\omega = cis\frac{2\pi}{3}$, then number of distinct roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0.$

A. 1

B. 2

C. 3

D. 4

Answer: A

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4. $\sin^{-1}(\cos x) = \frac{\pi}{2} - x$ is valid for

A. $-\pi \leq x \leq 0$

B. $0 \leq x \leq \pi$

C. $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

D. $-\frac{\pi}{4} \leq x \leq \frac{3\pi}{4}$

Answer: B

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5. $\tan^{-1} x + \cot^{-1} x = ...$

A. 1

B. $-\pi$

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

D. π

Answer: C

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6. The equation of the normal to the circle $x^2 + y^2 - 2x - 2y + 1 = 0$ which is parallel to the lines 2x + 4y =3 is

A. $x + 2y = 3$

B. $x + 2y + 3 = 3$

C. $2x + 4y + 3 = 0$

D. $x - 2y + 3 = 0$

Answer: A

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7. The axis of the parabola $x^2 = 20y$ is .....

A. $y = 5$

B. x = 5

C. x = 0

D. y = 0

Answer: C

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8. if $\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \vec{a} \times \left(\vec{b} \times \vec{c}\right)$ where $\vec{a}$, $\vec{b}$, $\vec{c}$ are any three vectors such that $\vec{b} . \vec{c} \neq 0$ and $\vec{a} . \vec{b} \neq 0$ then $\vec{a}$ and $\vec{c}$ are_____

A. $\vec{a}$ parallel to $\vec{b}$

B. $\vec{b}$ parallel to $\vec{c}$

C. $\vec{c}$ parallel to $\vec{a}$

D. $\vec{a} + \vec{b} + \vec{c} = \vec{0}$

Answer: C

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9. The vector equation of a plane whose distance from the origin is p and perpendicular to a unit vector $\hat{n}$ is .....

A. $\vec{r} . \vec{n} = p$

B. $\vec{r} . \hat{n} = q$

C. $\vec{r} \times \vec{n} = p$

D. $\vec{r} . \hat{n} = p$

Answer: D

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10. The point of inflection of the curve $y = (x-1)^3$ is

A. (0,0)

B. (0,1)

C. (1,0)

D. (1,1)

Answer: C

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

A. $x = 1$

B. $y = 1$

C. $y = -1$

D. $x = -1$

Answer: D

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12. The solution of the equation $\frac{dx}{dy} + Px = Q$ where P and Q are function of y is :

A. $y(I.F) = \int (I.F)Qdx + c$

B. $y(I.F) = \int (I.F)Qdy + c$

C. $y(I.F) = \int (I.F)Qdy + c$

D. $x(I.F) = \int (I.F)Qdx + c$

Answer: B

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13. A circular template has a radius of 10 cm. The measurnment of the radius has an approximate error of 0.02 cm. Then the

percentage error in calculating area of this template is

A. 0.2%

B. 0.4%

C. 0.04%

D. 0.08%

Answer: B

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14. For any value of $n \in Z, \int_0^{\pi} e^{\cos^2 x} \cos^3[(2n+1)x]dx$ is

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

B. π

C. 0

D. 2

Answer:

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15. If n is odd then $\int_0^{\pi/2} \sin^n x dx$ is

A. $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\cdots\frac{\pi}{2}$

B. $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\cdots\frac{\pi}{2}$

C. $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\cdots\frac{3}{2}.1$

D. $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\cdots\frac{2}{3}.1$

Answer: D

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16. 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. $x + y = c$

Answer: C

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17. If p and q are the oder and degree of the differential equation

$y\frac{dy}{dx} + x^3\left(\frac{d^2y}{dx^2}\right) + xy = \cos x,$ when

A. $p < q$

B. $p = q$

C. $p > q$

D. p exists and q does not exist .

Answer: C

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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 rolled 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

Answer: D

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19. If in 6 trials, X is a binomial variate which follows the relation 9P(X=4)=P(X=2), then the probability of success is

A. 0.125

B. 0.25

C. 0.375

D. 0.75

Answer: B

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20. Which one of the following statements has truth value F?

A. Chennai is in India or $\sqrt{2}$ is an integer

B. Chennai is in India or $\sqrt{2}$ is an irrational number

C. Chennai is in China or $\sqrt{2}$ is an integer

D. Chennai is in China or $\sqrt{2}$ is an irrational number

Answer: C

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Part Ii

1. If A=$\begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$, verify that A(adj A)= (adj A) A= $|A|I_2$.

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2. Find the value of $\sum_{k=1}^{8}\left(\cos\frac{2k\pi}{9}+i\frac{\sin 2k\pi}{9}\right)$

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3. Solve the eqation : $x^4-14x^2+45=0$

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4. Find the principle value of $\sin^{-1}\left(-\frac{1}{2}\right)$

(in radians and degrees)

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5. Show that the points $(2, 3, 4), (-1, 4, 5)$ and $(8, 1, 2)$ are collinear.

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6. Evaluate : $\int_0^{2\pi} \frac{\cos x}{\sqrt{4+3\sin x}} dx$

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7. Find the order and degree of the differential equation $\frac{d^2y}{dx^2} - y + \left(\frac{dy}{dx} + \frac{d^3y}{dx^3}\right)^{\frac{3}{2}} = 0$

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8. Suppose the amount of milk sold daily at a milk booth is distributed with a minimum of

200 litres and a maximum of 600 litres with probability density function

$$f(x) = \begin{cases} k & 200 \leq x \leq 600 \\ 0 & \text{otherwise} \end{cases}$$

Find

the probability that daily sales will fall between 300 litres and 500 litres?

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9. Let $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$,

$B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$

$C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$ by any three boolean matrices of the same type. Find (i) $A \vee B$, (ii) $A \wedge B$, (iii) $(A \vee A) \wedge C$, (iv) $(A \wedge B) \vee C$.

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10. Find the general equation of a circle with centre (-3,-4) and radius 3 units.

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Part Iii

1. If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$ prove that $A^{-1} = A^T$.

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2. If $z_1 = 2 + 5i$, $z_2 = -3 - 4i$, and $z_3 = 1 + I$, find the additive and multiplicative inverse of z_1, z_2 and z_3.

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3. Solve the equation $3x^3 - 26x^2 + 52x - 24 = 0$ if its roots form a geometric progression.

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4. Find the value of

$$\cot^{-1}\left(\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{4}{5}\right)$$

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5. if the normal at the point t_1 on the parabola $y^2 = 4ax$ meets the parabola again in the point t_2 then prove that $t_2 = -\left(t_1 + \frac{2}{t_1}\right)$

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6. Find the coordinates of the foot of the perpendicular drawn from the point (-1,2,3) to the straight line $\vec{r} = \left(\vec{i} - 4\hat{j} + 3\hat{k}\right) + t\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$.

Also , find the shortest distance from the given point to the straight line.

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7. Find the asymptotes of the curve $f(x) = \frac{2x^2 - 8}{x^2 - 16}$

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8. Evaluate : $\int_0^1 x(1-x)^n dx$.

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9. For the distribution function given by $F(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \leq x \leq 1 \\ 1, & x > 1 \end{cases}$. Find the density function.

Also evaluate (i) $P(0.5 < x < 0.75)$ (ii) $P(x \leq 0.5)$ (iii) $P(X > 0.75)$

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10. Let $w(x, y) = xy + \dfrac{e^y}{y^2 + 1}$ for all (x,y) $\in \mathbb{R}^2$. Calculate $\dfrac{\partial^2 w}{\partial y \, \partial x}$ and $\dfrac{\partial^2 w}{\partial x \, \partial y}$

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Part Iv

1. An amount of Rs 65,000 is invested in three bonds at the rates of 6 % , 8% and 10% per annum respectively. The total annual income is Rs 4,800. The income from the third bond is Rs

600 more than that from the second bond. Determine the price of each bond. (Use Gaussian elimination method.)

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2. Find the equation of the curve whose slope is $\frac{y-1}{x^2+x}$ and which passes through the point (1,0).

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3. If $arg(z-1)=\frac{\pi}{6}$ and $arg(z+1)=2\frac{\pi}{3}$,

then prove that $|z|=1$.

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4. Integrate the function

$$\frac{3x^2}{x^6+1}$$

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5. Solve the equation $x^3 - 9x^2 + 14x + 24 = 0$ if it is given that two of its roots are in the ratio 3:2.

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6. Show that the lines $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$ and $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ are coplanar .Al,so find the equation of the plane containing these two lines.

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7. Find the area of the region bounded by the parabola $y^2 = x$ and the line $y = x - 2$

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8. $\frac{dy}{dx} + \frac{y}{x \log x} = \frac{\sin 2x}{\log x}$

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9. $\cos\left(\sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)\right)$ is :

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10. Find the mean of a random variable X, whose probability density function is $f(x) = \begin{cases} \lambda e^{-\lambda x} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$.

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11. Show that the equation of the normal to the curve $x = a\cos^3\theta, y = a\sin^3\theta$ at $'\theta'$ is $x\cos\theta - y\sin\theta = a\cos 2\theta$.

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12. Verify (i) closure property (ii) commutative property (iii) associative property (iv) existence of identity and (v) existence of inverse for the operation $+_5$ on $\mathbb{Z}_5$ using table corresponding to addition modulo 5.

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13. Prove that $g(x, y) = x \log\left(\frac{y}{x}\right)$ is homogenous, what is the degree? Verify Euler's Theorem for g.

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