MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

IPE:MAY-2018(TS)

Section A

1. If $f: R - \{0\} \to R$ is defined by $f(x) = x^3 - \frac{1}{x^3}$, then S.T $f(x) + f(1/x) = 0$.

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2. Find the domain of the real function $f(x) = \frac{1}{(x^2 - 1)(x + 3)}$

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3. IF $\begin{bmatrix} x-2 & 2y-8 \\ z+2 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ -2 & a-4 \end{bmatrix}$ then find the values of z,y,z and a.

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4. IF $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is symmetric, find the value of x

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5. IF the vectors $-3\bar{i} + 4\bar{j} + \lambda\bar{k}$, $\mu\bar{i} + 8\bar{j} + 6\bar{k}$ are collinear vectors then find $\lambda \& \mu$.

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6. Find the shortest distance between the skew lines.

$\bar{r} = (6\bar{i} + 2\bar{j} + 2\bar{k}) + t(\bar{i} - 2\bar{j} + 2\bar{k})$ and

$\bar{r} = (-4\bar{i} - \bar{k}) + s(3\bar{i} - 2\bar{j} - 2\bar{k})$

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7. If $a\cos\theta - b\sin\theta = c,$ then show that $a\sin e\theta + b\cos = \pm\sqrt{a^2 + b^2 - c^2}$

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8. Find the maximum and minimum value of $f(x) = 3\cos x + 4\sin x$

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9. Find the equation of the straight line passing through $(-4, 5)$ and cutting off equal intercepts on the coordinate axes.

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10. Find the distance between the parallel lines $5x - 3y - 4 = 0, 10x - 6y - 9 = 0.$

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11. Find the coordinates of the vertex 'C' of ΔABC if its centroid is the origin and the vertices A,B are (1,1,1) are (-2,4,1) respectively.

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12. Find the intercepts of the plane $4x + 3y - 2z + 2 = 0$ on the coordinate axes.

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13. Evaluate $Lt_{x \to 0} \frac{e^x - 1}{\sqrt{1+x} - 1}$

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14. Evaluate :

$$Lt_{x \to 3} \frac{x^2 - 8x + 15}{x^2 - 9}$$

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15. If $f(x) = xe^x \sin x$ then find $f'(x)$.

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16. If $y = e^{a \sin^{-1} x}$ then prove that $\frac{dy}{dx} = \frac{ay}{\sqrt{1 - x^2}}$

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17. If the increase in the side of a square is 4% Then find the approximate percentage of increase in the area of the square.

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18. Define Lagrange's Mean value theorem.

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Section B

1. IF $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then show that $A^{-1} = A'$.

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2. Show that the four points $-\bar{a} + 4\bar{b} - 3\bar{c}, 3\bar{a} + 2\bar{b} - 5\bar{c}, -3\bar{a} + 8\bar{b} - 5\bar{c}, -3\bar{a} + 2\bar{b} + \bar{c}$ are coplanar, where $\bar{a}, \bar{b}, \bar{c}$ are non-coplanar vectors.

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3. The vectors $\overline{AB} = 3\bar{i} - 2\bar{j} + 2\bar{k}$ and $\overline{BC} = -\bar{i} - 2\bar{k}$ represent adjacent sides of a parallelogram ABCD. Find the angle between the diagonals.

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4. Show that $\cos^4\frac{\pi}{8} + \cos^4\frac{3\pi}{8} + \cos^4\frac{5\pi}{8} + \cos^4\frac{7\pi}{8} = \frac{3}{2}$

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5. Solve

$$3\sin^{-1}\left(\frac{2x}{1+x^2}\right) - 4\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + 2\tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{\pi}{3}$$

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6. If $\sin\theta = \frac{a}{b+c}$ then show that $\cos\theta = \frac{2\sqrt{bc}}{b+c}\cos\left(\frac{A}{2}\right)$

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7. Find the equation of locus of a point such that the difference of whose distances from (-5,0) and (5,0) is 8

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8. When the axes are rotated through an angle 45°, the transformed equation of a curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of the curve.

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9. A straight line through $P(3, 4)$ makes an angle of 60° with the positive direction of the X-axis. Find the coordinates of the points with the line whre are 5 units away from P.

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10. If f is given by $f(x) = \begin{cases} k^2x - k & \text{if } x \geq 1 \\ 2 & \text{if } x < 1 \end{cases}$ is a continuous function on R, then find k .

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11. Find the derivative of $\cot x$ from the first principle.

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12. Find the equations of tangent and normal to the curve xy = 10 at (2 , 5)

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13. The volume of a cube is increasing at a rate of 9 cubie centimeters per second. How fast is the surface area increasing when the length of edge is 10 cms?

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Section C

1. If $f = \{(4, 5), (5, 6), (6, -4)\}, g = \{(4, -4), (6, 5), (8, 5)\}$ find (i) $f + g$

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2. Using the principle of finite Mathematical Induction prove that $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots\ldots n terms = \frac{n(n+1)^2(n+2)}{12}, \forall n$

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3. Show that $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} = (a^3 + b^3 + c^3 - 3abc)^2$

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4. Solve the equations $x + y + 3z = 5, 4x + 2y - z = 0, -x + 3y + z = 5$ by matrix inversion method.

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5. IF A,B,C are angles in the triangle, then prove that $\cos A + \cos B - \cos C = -1 + 4\cos\frac{A}{2}.\cos\frac{B}{2}.\sin\frac{C}{2}$

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6. In a ΔABC if $r_1 = 8, r_2 = 12, r_3 = 24$ find a,b,c.

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7. Find the circumcentre of the triangle whose vertices are (1,3) (0,-2) and (-3,1).

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8. Show that the product of the perpendicular from (alpha,beta) to the pair of lines $S \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ is $\frac{|a\alpha^2 + 2h\alpha\beta + 2g\alpha + 2f\beta + c|}{\sqrt{(a-b)^2 + 4h^2}}$ Hence or otherwise find the product of the perpendicular from the origin

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9. Find the angle between the lines joining the origin to the points of intersection of the curve $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line 3x-y+1=0.

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10. If a line makes angles $\alpha, \beta, \lambda, \delta$ with the four diagonals of a cube, then show that $\cos^2\alpha + \cos^2\beta + \cos^2\lambda + \cos^2\delta = \frac{4}{3}$.

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11. If $y = \tan(-1)\left(\frac{\sqrt{(1+x^2)}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right)$ then find $\frac{dy}{dx}$.

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12. IF the tangent at any point P on the curve $x^m y^n = a^{m+n}$, $mn \neq 0$ meets the coordinate axes in A.B then show that $AP : BP$ is a constant.

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13. A wire of length l is cut into two parts which are bent respectively in the form of a square and a circle. What are the lengths of pieces of wire so that the sum of areas is least ?

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