MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

IPE: MARCH-2015 [TS]

Section A

1. $f: R \to R$ defined by $f(x) = \dfrac{2x+1}{3}$, then this function is injection or not? Justify.

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2. Find the range of the real valued function $f(x) = \sqrt{9 - x^2}$.

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3. Construct a 3×2 matrix whose elements are defined by $a_{ij} = \frac{1}{2}|i - 3j|$

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4. Find the rank of the metrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$.

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5. If $\bar{a} = 2\bar{i} + 5\bar{j} + \bar{k}$ and $\bar{b} = 4\bar{i} + m\bar{j} + n\bar{k}$ are collinear vectors then find m,n.

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6. OABC is a parallelogram. If $\overline{OA} = \bar{a}, \overline{OC} = \bar{c}$, find the vector equation of the side BC.

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7. Find anle between planes $\bar{r}.\left(2\bar{i}-\bar{j}+2\bar{k}\right)=3, \bar{r}.\left(3\bar{i}+6\bar{j}+\bar{k}\right)=4$

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8. Find the period of the function $\tan\left(x+4x+9x+\ldots\ldots\ldots+n^2x\right)$.

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9. If $\sin\alpha=\frac{3}{5}$, where $\frac{\pi}{2}<\alpha<\pi$, evaluate $\cos 3\alpha$.

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10. Prove that $(\cosh x-\sinh x)^n=\cosh(nx)-\sinh(nx)$

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Section B

1. Examine whether the following system of equations are consistent or inconsistent and if consistent, find the complete solution, $x + y + z = 1, 2x + y + z = 2, x + 2y + 2z = 1.$

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2. $\bar{a}, \bar{b}, \bar{c}$, are non-coplanar vectors, Prove that the following four points are coplanar.

$6\bar{a} + 2\bar{b} - \bar{c}, 2\bar{a} - \bar{b} + 3\bar{c}, \ -\bar{a} + 2\bar{b} - 4\bar{c}, \ -12\bar{a} - \bar{b} - 3\bar{c}.$

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3. Find the volume of the tetrahedron, whose vertices are $(1, 2, 1), (3, 2, 5), (2, \ -1, 0), (\ -1, 0, 1).$

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4. If $0 < A < B < \frac{\pi}{4}$ and $\sin(A+B) = \frac{24}{25}$ and $\cos(A-B) = \frac{4}{5}$, then find the value of $\tan 2A$.

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5. If θ_1, θ_2 are solutions of the equation $a\cos 2\theta + b\sin 2\theta = c$, $\tan\theta_1 \neq \tan\theta_2$ and $a + c \neq 0$, then find the values of (i) $\tan\theta_1 + \tan\theta_2$ (ii) $\tan\theta_1 . \tan\theta_2$.

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6. Prove that $\sin^{-1}\left(\frac{4}{5}\right) + 2\tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{2}$.

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7. Prove that $\cot A + \cot B + \cot C = \frac{a^2 + b^2 + c^2}{4 \triangle}$.

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Section C

1. Let $f = \{(1, a), (2, c), (4, d), (3, b)\}$ and $g^{-1} = \{(2, a), (4, b), (1, c), (3, d)\}$ then show that $(gof)^{-1} = f^{-1}og^{-1}$.

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2. Using Mathematical Induction, prove that statement for all $n \in N$

$1.2.3 + 2, 3, 4 + \ldots\ldots\ldots + (\text{upto n terms}) = \frac{n(n+1)(n+2)(n+3)}{4}$

.

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3. Find the value of x, if $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0.$

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4. By Cramer's rule, solve

$x - y + 3z = 5, 4x + 2y - z = 0, x + 3y + z = 5.$

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5. If

$\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}, \bar{b} = \bar{i} - 2\bar{j} + \bar{k}, \overline{C} = -\bar{i} + \bar{j} - 4\bar{k}, \overline{D} = \bar{i} + \bar{j} + \bar{k}$

, then compute $\left|\left(\bar{a} \times \bar{b}\right) \times \left(\bar{c} \times \bar{d}\right)\right|$.

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6. If $A+B+C=\pi$, then prove that $\cos^2\left(\frac{A}{2}\right)+\cos^2\left(\frac{B}{2}\right)+\cos^2\left(\frac{C}{2}\right)=2\left(1+\sin.\frac{A}{2}\sin.\frac{B}{2}\sin.\frac{C}{2}\right)$

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7. If $r_1=2, r_2=3, r_3=6$ and $r=1$, prove that $a=3, b=4$ and $c=5$.

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