Aimstutorial MODEL PAPER - 5

MATHS - 1A

SECTION - A

I. Answer ALL the following Very Short Answer Questions: **[10 x 2 = 20]**

1. If f : Q→Q is defined by f(x) = 5x + 4, find f^{-1}.
2. Find the domain of the real function f(x) = $\frac{1}{\sqrt{1-x^2}}$.
3. Find the trace of $\begin{bmatrix} 1 & 3 & 5 \\ 2 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$.
4. If $\begin{bmatrix} 0 & 2 & 1 \\ -2 & -0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew symmetric matrix then find the value of x.
5. If α, β and γ be the angle made by the vector $3\bar{i}-6\bar{j}+2\bar{k}$ with the positive directions of the coordinate axes, then find cosα, cosβ and cosγ.
6. Find the vector equation of the line passing through the points $2\bar{i}+\bar{j}+3\bar{k}$, $-4\bar{i}+3\bar{j}-\bar{k}$.
7. If $\bar{a}=\bar{i}+2\bar{j}-3\bar{k}$ $\bar{b}=3\bar{i}-\bar{j}+2\bar{k}$ then show that $\bar{a}+\bar{b}$, $\bar{a}-\bar{b}$ are perpendicular.
8. Prove that $\frac{\cos 9^0+\sin 9^0}{\cos 9^0-\sin 9^0}$ = cot 36^0.
9. Find the period of f(x) = $\cos\left(\frac{4x+9}{5}\right)$.
10. If sinhx = $\frac{3}{4}$ then find cosh2x and sinh 2x.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: **[5 x 4 = 20]**

11. If A = $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ then show that $A^{-1} = A^3$.
12. If the points whose postion vecotrs are $3\bar{i}-2\bar{j}-\bar{k}$, $2\bar{i}+3\bar{j}-4\bar{k}$, $\bar{i}+\bar{j}+2\bar{k}$, $4\bar{i}+5\bar{j}+\lambda\bar{k}$ are coplanar, then show that $\lambda=\frac{146}{17}$.
13. Find the area of the triangle formed with the points A(1,2,3), B(2,3,1), C(3,1,2).
14. Show that sin A = $\frac{\sin 3A}{1+2\cos 2A}$. Hence find the value of $\sin 15^0$.
15. Solve sinθ + sin5θ - sin3θ, $0 < \theta < \pi$.
16. Prove that $\text{Tan}^{-1}\frac{1}{2}+\text{Tan}^{-1}\frac{1}{5}+\text{Tan}^{-1}\frac{1}{8}=\frac{\pi}{4}$.
17. If $\cot\frac{A}{2}:\cot\frac{B}{2}:\cot\frac{C}{2}$ = 3 : 5 : 7 then show that a:b:c = 6:5:4.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. If f : A→B, g:B→C are two bijective funcitons then prove that gof:A→C is also a bijective function.

19. Using the principle of finite Mathematical Induction prove that

1.2.3+2.3.4+3.4.5+.....upto n terms = $\frac{n(n+1)(n+2)(n+3)}{4}$, $\forall n \in N$.

20. Show that $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$ = (a - b)(b - c)(c- a)(ab + bc + ca).

21. Solve the following equations 3x + 4y + 5z = 18, 2x - y + 8z = 13 and 5x - 2y + 7z = 20 by Gauss-Jordan method.

22. Prove that the smaller angle θ between any two diagronals of a cube is given by $\cos\theta = 1/3$.

23. If A, B, C are angles in a triangle, then prove that $\sin^2A + \sin^2B - \sin^2C = 2\sin A\sin B\cos C$.

24. In ΔABC prove that $\frac{r_1}{bc} + \frac{r_2}{ca} + \frac{r_3}{ab} = \frac{1}{r} - \frac{1}{2R}$.

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