57 Code : 93C01M

Register Number | | | | | | | |

I Semester Diploma Examination, Nov./Dec. 2013

APPLIED MATHEMATICS – I

3 Hours] [Max. Marks : 100

(i) Answer any 10 questions in **Section-A**, 5 questions in **Section-B**, 8 questions in **Section C** & 3 questions in **Section D**.
(ii) Each question in Section – A carries 2 marks.
(iii) Each question in remaining Sections carries 5 marks.

SECTION – A

Note : Answer any 10 questions. Each carries 2 marks.

If $A = \begin{pmatrix} 2 & 3 & 1 \\ 5 & -4 & 0 \end{pmatrix}$ & $B = \begin{pmatrix} 3 & 2 & 1 \\ 4 & 6 & -1 \end{pmatrix}$, find A + B.

If $A = \begin{pmatrix} 2 & -1 \\ 3 & 4 \end{pmatrix}$, find the matrix A^2.

If $\begin{vmatrix} 1 & 5 & 7 \\ 2 & x & 14 \\ 3 & 1 & 2 \end{vmatrix} = 0$, find the value of x.

If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ & $\vec{b} = 4\hat{i} - \hat{j} - 5\hat{k}$, find $\vec{a} + \vec{b}$.

If $\vec{a} = -5\hat{i} - 6\hat{j} + 7\hat{k}$, find $|\vec{a}|$.

Find the 5^{th} term in the expansion of $\left(x + \frac{1}{x}\right)^9$.

Express 120° in radian.

Prove that $1 + \tan^2\theta = \sec^2\theta$.

Find the value of sin 15°.

11. Prove that $\text{cosec}^{-1} x = \sin^{-1}\left(\frac{1}{x}\right)$.

12. In any ΔABC, prove that $\tan(A + B) = -\tan C$.

13. Find the distance between the points A (8, 3) & B (5, 7).

14. Find the slope of the line joining the points (2, 5) & (4, 6).

15. Find the equation of a straight line passing through the point (4, 5) and ha slope 5.

SECTION – B

Note : Answer any **five** questions.

Solve for x using Cramer's rule.

$$3x + y - z = 4$$
$$x + y + 2z = 9$$
$$5x - y + z = 12$$

Find the adjoint of $\begin{pmatrix} 4 & 1 & -1 \\ 0 & 2 & 1 \\ 3 & -1 & 1 \end{pmatrix}$

Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} -2 & 5 \\ 7 & 4 \end{pmatrix}$.

Find the constant term in the expansion of $\left(x^3 + \frac{3}{x}\right)^8$.

Prove that $\log\left(\frac{x}{y}\right) + \log\left(\frac{y}{z}\right) + \log\left(\frac{z}{x}\right) = 0$.

Find the cosine of the angle between the vectors $\vec{a} = 8\hat{i} + 2\hat{j}$ & $\vec{b} = 3\hat{i} + 4\hat{j}$.

If $\vec{a} = \hat{i} - 4\hat{j} + 8\hat{k}$ & $\vec{b} = 2\hat{i} + 2\hat{j} + \hat{k}$, find $\vec{a} \times \vec{b}$.

SECTION – C

Answer any **8** questions.

Find the area of sector of a circle of radius 12 cm and central angle 30°.

Prove that $\frac{1}{1+\cos\theta} + \frac{1}{1-\cos\theta} = 2\,\text{cosec}^2\theta$.

Prove that $\tan^2 30° + \sin^2 45° + \cos^2 60° + \cos^2 90° = \frac{13}{12}$

If $\tan\theta = \frac{5}{12}$ and θ is acute, find the value of $\frac{4\sin\theta - 2\cos\theta}{3\cos\theta + 5\sin\theta}$.

Evaluate $\sin 420° \cos 150° + \cos 300° \sin 750°$.

The angle of elevation of the top of a tower at a distance 75 m is 60°. Find the height of tower.

Prove that $\frac{1+\cos 2A}{\sin 2A} = \cot A$.

Prove that $\frac{1+\cos\theta+\cos\left(\frac{\theta}{2}\right)}{\sin\theta+\sin\left(\frac{\theta}{2}\right)} = \cot\left(\frac{\theta}{2}\right)$

Prove that $\frac{\cos 7\theta - \cos 9\theta}{\sin 7\theta + \sin 9\theta} = \tan\theta$.

In any ΔABC, prove that $\tan A + \tan B + \tan C = \tan A \tan B \tan C$.

Solve the Δ ABC, give that $a = 2$, $b = \sqrt{6}$ and $\angle C = 60°$.

SECTION – D

Note : Answer any **3** questions.

Find the distance between the points (9, 2) and (3, 8).

Find the coordinates of the point dividing the line joining the points A (6, 5), B (3, internally in the ratio 1 : 2.

Find the equation of a straight line passing through the point (2, 5) and hav slope 2.

Find the equation of a straight line passing through the point (1, 4) and perpendicu to the line $2x - 3y + 5 = 0$.