

COMMON WITH BIO MEDICAL, COMPUTER, COMPUTER INFORMATION,
ELECTRICAL, ELECTRONICS, FOOD, FOOD PROCESSING & PRESERVATION,
INFORMATION & COMMUNICATION, INSTRUMENT, INSTRUMENTATION,
MECHATRONICS AND TELECOMMUNICATION TECHNOLOGIES.

MATH.123 APPLIED MATHEMATICS-I

PAPER 'A' (Subjective)

Time: 2:30 Hours

Marks: 60

SECTION-I

Q. 1 Write short answers to any Eighteen (18) questions.

18x2=36

1. Solve the quadratic equation $3x^2 + 5x = 2$ by factorization.
2. Solve the equation $x^2 - 2x - 899 = 0$ by completing the square.
3. Discuss the nature of the roots of the equation $9x^2 + 6x + 1 = 0$.
4. Find the value of K if the sum of the roots of the equation $(2k-1)x^2 + (4k-1)x + (K+3) = 0$ is $5/2$.
5. For what value of k the sum of roots of equation $3x^2 + kx + 5 = 0$ may be equal to the product of roots.
6. Expand $\left(\frac{x}{y} + \frac{y}{x}\right)^4$ by Binomial theorem.
7. Calculate $(1.02)^{10}$ by Binomial Theorem up to two decimal places.
8. Find the 6th term in the expansion of $(x + 3y)^{10}$.
9. Expand $\frac{1}{\sqrt{1+x}}$ to three terms.
10. Using the Binomial series, calculate $\sqrt{80}$ to the nearest hundredth.
11. Convert $\frac{2\pi}{3}$ radians into degree measure.
12. Prove that $2 \sin 45^\circ + \frac{1}{2} \operatorname{cosec} 45^\circ = \frac{3}{\sqrt{2}}$.
13. Prove that $\cos 30^\circ \cos 60^\circ - \sin 30^\circ \sin 60^\circ = 0$.
14. Prove that $\frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta} = 2 \sec 2\theta$.
15. Prove that $\cos\left(\frac{\pi}{2} - \beta\right) = \sin \beta$.
16. Show that $\cos(\alpha + \beta) - \cos(\alpha - \beta) = -2 \sin \alpha \sin \beta$.
17. Prove that $\sin \alpha = 2 \sin \frac{\alpha}{2} \cos \frac{\alpha}{2}$.
18. Find $\cos \theta$ if $\sin \theta = \frac{7}{25}$ and angle θ is an acute angle.
19. Define the law of sine.
20. In any triangle ABC if $a = 20$, $c = 32$ and $C = 70^\circ$, Find A.
21. The shadow of Qutab Minar is 81m long when the measure of the angle of elevation of the sun is $41^\circ 31'$. Find the height of the Qutab Minar.
22. In any triangle ABC if $b = 25$, $c = 37$, $A = 65^\circ$, Find a.
23. Find a, so that $|a + (a+1)i + 2k| = 3$.
24. Define Vector product.
25. Under what conditions does the relation $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}|$ holds for two vectors \vec{a} and \vec{b} .
26. Express $\sqrt{2} \angle 45^\circ$ in Rectangular forms. i.e. $a + j b$.
27. Find the product of $Z_1 = 2 \angle 15^\circ$, $Z_2 = -1 \angle 30^\circ$.

SECTION-II

Note: Attempt any three (03) questions.

3x8=24

Q.2 (a) Solve the equation $x^2 + (m-n)x - 2(m-n)^2 = 0$ by using quadratic formula.

(b) The roots of the equation $px^2 + qx + q = 0$ are α and β ,

Prove that
$$\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$$

Q.3 (a) Find the term involving q^8 in the expansion of $\left(\frac{p^2}{2} + 6q^2\right)^{12}$

(b) Find the coefficient of x^5 in the expansion of $\frac{(1+x)^2}{(1-x)^2}$

Q.4 (a) If $\sin \theta = \frac{2}{3}$, and the terminal side of the angle lies in the second quadrant, find the remaining trigonometric ratios of θ .

(b) Prove that
$$\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta} = \frac{(1 - \tan \theta)^2}{(1 - \cot \theta)^2}$$

Q.5 (a) Prove that $\sin^4 \theta = \frac{3}{8} - \frac{1}{2} \cos 2\theta + \frac{1}{8} \cos 4\theta$

(b) A television antenna is on the roof of a building. From a point on the ground 36m from the building, the angle of elevation of the top and the bottom of the antenna are 51° and 42° respectively. How tall is the antenna?

Q.6 (a) Using cross product, find the area of triangle whose vertices are $(0, 0, 0)$, $(1, 1, 1)$, $(0, 0, 3)$

(b) Simplify $(\sqrt{3} + j)^7$ and express the result in $a + jb$ form.
