

DAE/IA-2015/08 FIRST YEAR
MATH-123 APPLIED MATHEMATICS – I
COMMON WITH BIO MEDICAL, COMPUTER,
COMPUTER INFORMATION, ELECTRICAL, ELECTRONICS, FOOD,
FOOD PROCESSING & PRESERVATION, INFORMATION & COMMUNICATION,
INSTRUMENT, INSTRUMENTATION, MECHATRONICS AND
TELECOMMUNICATION TECHNOLOGIES.

PAPER 'A' (Subjective)

Time: 2:30 Hours

SECTION – I

Marks: 60

Q.1: Write short answer to any Eighteen (18) questions: -

18 × 2 = 36

1. Solve by factorization the equation $x^2 + 7x + 8 = 0$.
2. Solve by the method of completing the square $x^2 - 6x + 8 = 0$.
3. Find the nature of the roots of the equations $6x^2 = 7x + 5$.
4. Find the sum and the Product of the roots in the equation $2x^2 + 4 = 7x$.
5. Form the quadratic equation whose roots are $3\sqrt{5}, -3\sqrt{5}$.
6. Write the 1st and last terms of $\left(\frac{x}{y} - \frac{y}{x}\right)^4$.
7. Expand up to four terms. $(2 + x)^{-3}$.
8. Which term is the middle term/terms in the Binomial expansion of $(a + b)^n$, when n is odd.
9. Which term is the middle term/terms in the Binomial expansion of $(a + b)^n$, when n is even.
10. Find the 6th term in the expansion of $(x + 3y)^{10}$.
11. What is the length of an arc of a circle of radius 5cm whose central angle is 140°?
12. Verify that $\sin^2 \frac{\pi}{6} + \sin^2 \frac{\pi}{3} + \tan^2 \frac{\pi}{4} = 2$.
13. Prove that $\frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta} = 2 \sec^2 \theta$.
14. If $\sin \theta = \frac{7}{25}$, find $\cos \theta$, if 'θ' is an acute angle.
15. Without using the calculator, find the value of $\sin 15^\circ$.
16. Prove that $\frac{\sin(\alpha + \beta)}{\cos \alpha \cos \beta} = \tan \alpha + \tan \beta$.
17. If $\cos \theta = \frac{-5}{13}$ and the terminal side of 'θ' is in second quadrant, find the value of $\cos \frac{\theta}{2}$.
18. Express the difference $\cos 12\theta - \cos 4\theta$ as product.
19. In right triangle ABC, $\gamma = 90^\circ$, $a = 5$, $c = 13$, then find 'α'.
20. The Shadow of a building is 220 meters when the measure of the angle of elevation of the sun is 35° . Find the height of the building.
21. In any triangle ABC, by using the law of Cosines, if $a = 13$, $b = 10$, $c = 17$, find β.
22. In any triangle ABC, if $b = 82$, $\beta = 57^\circ$, $\gamma = 78^\circ$, find a.
23. Find real numbers x, y and z such that $(x + 4)i + (y - 5)j + (z - 1)k = 0$.
24. if $\vec{a} = -i - j - k$, $\vec{b} = 2i + j$, find $\vec{a} \cdot \vec{b}$
25. Find the area of parallelogram determined by the vectors $\vec{a} = i + 2j + 3k$ & $\vec{b} = -3i - 2j + k$.
26. Express $-1 - j$ in polar form.
27. Express $10e^{j60^\circ}$ in $a + jb$ form.

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

- Q.2:** (a) Solve $mx^2 + (1+m)x + 1 = 0$ by using Quadratic formula.
- (b) Find the value of 'K' if sum of roots of $(2k-1)x^2 + (4k-1)x + (k+3) = 0$ is $\frac{5}{2}$.
- Q.3:** (a) Find the coefficient of x^{19} in $(2x^3 - 3x)^9$.
- (b) Find the coefficient of b^6 in the expansion of $\left(\frac{a^2}{2} + 2b^2\right)^{10}$.
- Q.4:** (a) Prove that $\sin^2 \frac{\pi}{6} : \sin^2 \frac{\pi}{4} : \sin^2 \frac{\pi}{3} : \sin^2 \frac{\pi}{2} = 1 : 2 : 3 : 4$
- (b) Prove that $(1 - \tan \theta)^2 + (1 - \cot \theta)^2 = (\sec \theta - \operatorname{cosec} \theta)^2$.
- Q.5:** (a) Show that $\cos(\alpha + \beta)\cos(\alpha - \beta) = \cos^2 \alpha - \sin^2 \beta$.
- (b) In any triangle ABC, if $a = 211.3$, $\beta = 48^\circ 16'$, $\gamma = 71^\circ 38'$ find b .
- Q.6:** (a) If $\vec{a} = 3\mathbf{i} - 2\mathbf{j} + 5\mathbf{k}$ & $\vec{b} = -2\mathbf{i} - \mathbf{j} + \mathbf{k}$ Find $2\vec{a} - 3\vec{b}$ and also its unit vector.
- (b) If the vectors $3\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\lambda\mathbf{i} - 4\mathbf{j} + 4\mathbf{k}$ are parallel, find value of λ .
