DAE/IA-2016/08 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: - $18 \times 2 = 36$

1. Solve $x^2 - 3x = 2x - 6$ by using Quadratic formula.
2. Discuss the nature of the roots of the equation $x^2 - 2\sqrt{2}x + 2 = 0$.
3. Prove that the roots of the equation $(a+b)x^2 - ax - b = 0$ are rational.
4. Find the sum and product of the roots of the equation $9x^2 + 6x + 1 = 0$.
5. Form the quadratic equations whose roots are $i\sqrt{3}$, $-i\sqrt{3}$.
6. Expand $(2x - 3y)^4$ by Binomial theorem.
7. Calculate $(1.04)^5$ by Binomial theorem up to two decimal places.
8. Expand $(1+2x)^{-2}$ to three terms.
9. Which will be the middle term/terms in the expansion of $\left(x + \frac{3}{x}\right)^{15}$.
10. Find 5th term in the expansion of $\left(2x - \frac{x^2}{4}\right)^7$.
11. Convert $22\frac{1}{2}°$ into radian measure.
12. Find the radius of a circle when ℓ = 8.4cm, θ = 2.8 rad.
13. Find 'x' if $\tan^2 45° - \cos^2 60° = x \sin 45° \cos 45° \tan 60°$..
14. Prove that $\cos^4\theta - \sin^4\theta = 1 - 2\sin^2\theta$.
15. Prove that: $\cos(-\beta) = \cos\beta$.
16. Express $\sin x \cos 2x - \sin 2x \cos x$ as single term.
17. Prove that: $\sin^2\alpha = \frac{1 - \cos 2\alpha}{2}$.
18. Express $\cos 12\theta + \cos 4\theta$ as product.
19. Given that γ = 90º, α = 35º, a = 5, find angle β.
20. Define angle of depression.
21. The shadow of Qutab-Minar is 81m long when the measure of the angle of elevation of the sun is $41°31'$. Find the height of the Qutab-Minar.
22. In any triangle ABC in which a = 5 , c = 6, α = 45º, find γ.
23. Find a unit vector parallel to the sum of the vectors: $\vec{a} = [2, 4, -5]$, $\vec{b} = [1, 2, 3]$
24. Find $(\vec{a} + \vec{b}).(\vec{a} - \vec{b})$ if $\vec{a} = 2i + 2j + 3k$, $\vec{b} = 2i - j + k$.
25. Under what condition does the relation $\vec{a}.\vec{b} = |\vec{a}|\,|\vec{b}|$ hold.
26. Express $\sqrt{3} + j$ in polar form.
27. Simplify the phasor $\frac{-9 + j4}{8 - j3}$ and write the result in Rectangular form.

SECTION – II

Note: Attempt any three (03) questions. $3 \times 8 = 24$

Q.2: (a) Solve the equation $\frac{a}{ax-1} + \frac{b}{bx-1} = a + b$ by factorization.

(b) Find the value of k given that if one root of $9x^2 - 15x + k = 0$ exceeds the other by 3. Also find the roots.

Q.3: Find the coefficient of 'x^5' in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{10}$.

Q.4: (a) If $m = \tan\theta + \sin\theta$ and $n = \tan\theta - \sin\theta$ then prove that: $m^2 - n^2 = 4\sqrt{mn}$.

(b) If $\cos A = \frac{1}{5}$ and $\cos B = \frac{1}{2}$, where A and B be acute angles, find the value of $\cos(A - B)$.

Q.5: (a) Prove that: $\cos 20° + \cos 100° + \cos 140° = 0$

(b) Solve the triangle ABC when c = 4, α = 70º, γ = 42º.

Q.6: (a) Given the vectors $\vec{a} = 3i - 2j + 4k$ & $\vec{b} = 2i + j + 3k$, Find the magnitude and direction cosines of $3\vec{a} - 2\vec{b}$.

(b) Express $\frac{(3+2j)(5-3j)}{3-4j}$ in the form $a + jb$.

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