DAE/IIA-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 the equation by factorization $3x^2 + 5x = 2$.
2. Solve by the method of completing the square $x^2 + 5x - 6 = 0$.
3. Discuss the nature of the roots of the equation $9x^2 + 6x + 1 = 0$.
4. For what value of 'k' the roots of the equation $2x^2 + 5x + k = 0$ are equal.
5. If α, β are the roots of the equation $x^2 - 4x + 2 = 0$, find the equations whose roots are $-\alpha$, $-\beta$.
6. Expand the expression $\left(\frac{x}{y} + \frac{y}{x}\right)^4$.
7. Find the 7th term in the expansion of $\left(x - \frac{1}{x}\right)^9$.
8. Expand up to three terms $(1 + 2x)^{-2}$.
9. Using the Binomial series, calculate $\sqrt[3]{65}$ to the nearest hundredth.
10. Find the middle term in the expansion of $(2x + 3)^{12}$.
11. Convert 0.726 radian into degree measure.
12. Prove that $\ell = r\theta$..
13. Prove that: $\tan^2 30° + \tan^2 45° + \tan^2 60° = \frac{13}{3}$
14. Prove that $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$
15. Prove that $\cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$.
16. Express $\sin x \cos 2x - \sin 2x \cos x$ as single term.
17. Prove that $\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$
18. Express $\cos 3\theta \cos\theta$ as sum or difference.
19. In right triangle ABC, γ = 90º, a = 5, c = 13, then find 'α'.
20. In any triangle ABC, if a = 20, c = 32 and γ = 70º, find angle 'α'.
21. Define angle of elevation and depression.
22. In any triangle ABC, if b = 45, c = 34 and $\alpha = 52°$, find 'a'.
23. What are parallel vectors?
24. Find the unit vector along the vector $4i - 3j - 5k$.
25. For what value of 'λ'., the vectors $2i - j + 2k$ and $3i + 2\lambda j$ are perpendicular.
26. Find the conjugate and modulus of $-\frac{2}{3} - j\frac{4}{9}$
27. Simplify the phasor $\frac{1}{4 - j5} - \frac{1}{5 - j4}$ 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 $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$ by factorization.

(b) If the difference of the roots of the equation $x^2 - 7x + k - 4 = 0$ is 5, find the values of 'k', and the roots.

Q.3: Find the constant term in the expansion of $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$.

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: $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = 1 - 2\sec\theta\tan\theta + 2\tan^2\theta$

Q.5: (a) If $\tan\beta = \frac{n\sin\alpha\cos\alpha}{1 - n\sin^2\alpha}$, Prove that $\tan(\alpha - \beta) = (1 - n)\tan\alpha$.

(b) Prove that: $\sin 5\theta + 2\sin 3\theta + \sin\theta = 4\sin 3\theta\cos^2\theta$

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) If $\vec{a} = 2i - 3j + 4k$ & $\vec{b} = 2j + 4k$ Find the component or projection of $\vec{a}$ along $\vec{b}$.

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