DAE/IIA-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: - $18 \times 2 = 36$

1. Solve the equation $3x^2 + 7x + 4 = 0$ by factorization.
2. Find the nature of the roots of given equation $2x^2 + 3x + 1 = 0$
3. Find the sum and the Product of the roots in the equation $2x^2 + 4 = 7x$
4. Form the quadratic equation whose roots are $2, -3$
5. Solve the quadratic equation $mx^2 + (1+m)x + 1 = 0$
6. Expand $(2x - 3y)^4$ by Binomial theorem.
7. Which will be the middle term/terms in the expansion of $(2x+3)^{12}$
8. Compute $(2.03)^5$ to two decimal places of decimal by use of binomial formula.
9. Using the binomial expansion, calculate to the nearest hundredth $\sqrt{17}$
10. Expand $\frac{1}{(1+x)^2}$ to three terms.
11. Convert $42°36'12''$ into radian measure.
12. Prove that $(1 - \sin^2\theta)(1 + \tan^2\theta) = 1$
13. What is the length of an arc of a circle of radius 5cm whose central angle is 140º?
14. If α, β and γ are the angle of triangle ABC, then prove that $\cos(\alpha + \beta) = -\cos\gamma$.
15. Prove that $\tan^2 30° + \tan^2 45° + \tan^2 60° = \frac{13}{3}$.
16. Prove that $\sin\theta + \cos\theta = \sqrt{2}\sin\left(\theta + \frac{\pi}{4}\right)$.
17. Express the difference $\cos\theta - \cos 5\theta$ as product.
18. Find the value of $\cos 75°$ without using the calculator.
19. In any triangle ABC if a = 10, b = 15, β = 50º, Find α.
20. Given that γ = 90º, α = 35º, a = 5, find angle β.
21. In any triangle ABC, by using the law of Cosines, if b = 25, c = 37, $\alpha = 65^0$, find a.
22. Define the law of Sines.
23. Find the magnitude and direction cosine of the vector $i - 5j - 8k$.
24. Find 'x' so that $\vec{a}$ and $\vec{b}$ are perpendicular, where $\vec{a} = xi - 2j + 5k$, $\vec{b} = 2i - j + 3k$.
25. Prove that for the vector $\vec{a}$ and $\vec{b}$, $|\vec{a} \times \vec{b}|^2 + |\vec{a}.\vec{b}|^2 = |\vec{a}|^2 |\vec{b}|^2$.
26. Show that the vectors $3i - j + 7k$ and $-6i + 3j + 3k$ are at right angle to each other.
27. Find a unit vector parallel to the sum of the vectors: $\vec{a} = [2, 4, -5]$, $\vec{b} = [1, 2, 3]$

SECTION – II

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

Q.2: (a) Solve $mx^2 + (1+m)x + 1 = 0$ by using Quadratic formula.

(b) If α, β are the roots of the equation $x^2 - 4x + 2 = 0$, find the equations whose roots are α^2, β^2.

Q.3: Find the coefficient of x^{20} in the expansion of $\left(2x^2 + \frac{1}{2x}\right)^{16}$.

Q.4: (a) Prove that $\frac{1+\tan^2\theta}{1+\cot^2\theta} = \frac{(1-\tan\theta)^2}{(1-\cot\theta)^2}$

(b) How far apart are two cities on the equator whose longitudes are 10º E and 50º W? (Radius of the earth is 6400km).

Q.5: (a) Prove that $\frac{\sin(\alpha+\beta)}{\cos\alpha\cos\beta} = \tan\alpha + \tan\beta$.

(b) In any triangle ABC, if $\alpha = 60^\circ$, $\beta = 45^\circ$, Find the ratio of b to c.

Q.6: (a) If $\vec{a} = 3i + j - k$, $\vec{b} = 2i - j + k$ and $\vec{c} = 5i + 5j + 3k$, find $(2\vec{a} + \vec{b}).\vec{c}$

(b) Find the sine of the angle and unit vector perpendicular to each: $\vec{a} = i + j + k$ and $\vec{b} = 2i + 3j - k$.

****