DAE/IIA-2017/09
FIRST YEAR
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)
SECTION-I

Time: 2:30 Hours   Marks: 60

Q.1   Write short answers to any Eighteen (18) questions.   18x2=36

1. Solve the equation $x^2 - 3x = 2x - 6$ by factorization

2. Solve the quadratic equation $x^2 + 7x + 12 = 0$

3. Find the value of K given that the sum of the roots of the equation.

   $3x^2 + kx + 5 = 0$ will be equal to the product of its roots.

4. Form the quadratic equation whose roots are $3 + i, 3 - i$

5. Find the sum and product of the roots of $x^2 - 9 = 0$

6. Expand $\left(x + \frac{1}{x}\right)^4$ by Binomial theorem.

7. Find the 5th term in the expansion of $(2x - \frac{x^2}{4})^7$.

8. Expand $(1 + x)^{-3}$ up to three terms.

9. Compute $(1.02)^4$ to two decimal places by use of Binomial formula.

10. Which term is the middle terms in the Binomial expansion of $(a + b)^n$

    (i) when n is even   (ii) when n is odd

11. Find the missing element ℓ, r, θ when $\ell = 8.4$, $m, \theta = 2.8 \ rad$

12. Evaluate $Cos30°Cos60° - Sin\ 30°Sin60°$

13. Prove that $1 - 2Sin^2\theta = 2Cos^2\theta - 1$

14. Show that $Sin(\alpha + \beta) + Sin(\alpha - \beta) = 2Sin\alpha Cos\beta$

15. Find the value of Sin 105°, without using calculator.

16. Express $Sin5\theta - Sin\theta$ as product

17. Prove that $Cos^4\theta - Sin^4\theta = \frac{1}{Sec2\theta}$

18. Prove that $Sin(180° - \theta) = Sin\theta$

19. In any triangle ABC if a=3 , b=7 , $\beta = 85°$ Find α

20. Write the Law of Cosines.

21. In any triangle ABC if b=5 , c=8 , $\alpha = 60°$ Find a

22. The shadow of a building is 220 meters when the measure of the angle of elevation of the sun in 35°. Find the height of the building.

23. Show that the vectors $4\underline{i} - 6\underline{j} + 9\underline{k}$ and $-6\underline{i} + 9\underline{j} - \frac{27}{2}\underline{k}$ are parallel.

24. Find $\overline{a}.\overline{b}$ if $\overline{a} = 2\underline{i} + 3\underline{j} + 4\underline{k}$, $\overline{b} = \underline{i} - \underline{j} + \underline{k}$

25. For what value of λ the vector $2\underline{i} - \underline{j} + 2\underline{k}$ and $3\underline{i} + 2\lambda\underline{j}$ are perpendicular.

26. Given the vectors $\overline{a} = 3\underline{i} + \underline{j} - \underline{k}$, $\overline{b} = 2\underline{i} + \underline{j} - \underline{k}$ Find magnitude of $3\overline{a} - \overline{b}$

27. Given vector $\overline{a} = 3\underline{i} - 2\underline{j} + 4\underline{k}$, $\overline{b} = 2\underline{i} + \underline{j} + 3\underline{k}$ Find the magnitude and

Direction Cosines of $\overline{a} - \overline{b}$.

SECTION-II

Note: Attempt any three (3) questions. (3x8 = 24)

Q.2 (a) Solve the equation $\frac{4}{x-1} - \frac{5}{x+2} = \frac{3}{x}$ by Factorization. (4+4)

(b) Show that the roots of the equation $(mx + c)^2 = 4ax$ will be equal if $c = \frac{a}{m}$

Q.3 Find the middle term in the expansion of $\left(3x^2 + \frac{1}{2x}\right)^{10}$ (8)

Q.4 (a) If $Cos\theta = -\frac{\sqrt{3}}{2}$ and the terminal side of the angle lies in the third quadrant, (4+4) Find the remaining trigonometric ratios of θ.
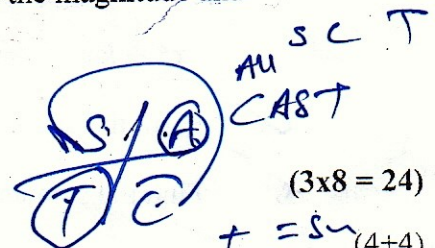
(b) Prove that $\frac{Cot^2\theta - 1}{Cot^2\theta + 1} = 2Cos^2\theta - 1$

Q.5. (a) Show that $\frac{Sin75° - Sin15°}{Cos75° + Cos15°} = \frac{1}{\sqrt{3}}$. (4+4)

(b) Solve the right triangle ABC in which $\gamma = 90°, a = 250, \alpha = 42°25'$

Q.6 (a) Find the Cosine of the angle between the vectors $\overline{a} = 2\underline{i} - 8\underline{j} + 3\underline{k}$, $\overline{b} = 4\underline{j} + 3\underline{k}$. (4+4)

(b) Find the vector whose magnitude is 5 and which is in the direction of vector

$4\underline{i} - 3\underline{j} + \underline{k}$.

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