Roll No._____

DAE/IA-2019/09

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)

Time: 2:30 Hours **Marks: 60**

SECTION-I

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

1. Solve the quadratic equation $x(x+7) = (2x-1)(x+4)$ by factorization.
2. Solve the equation $x^2 - 6x + 8 = 0$ by completing the square.
3. Discuss the nature of the roots of the equation $x^2 + x + 1 = 0$.
4. For what value of K the roots of the equation $Kx^2 + 4x + 3 = 0$ are equal.
5. Find the sum and product of the roots of the equation $9x^2 + 6x + 1 = 0$.
6. Expand $\left(\frac{x}{2} - \frac{2}{y}\right)^4$ by Binomial theorem.
7. Calculate $(1.04)^5$ by Binomial Theorem up to two decimal places.
8. Find the 8^{th} term in the expansion of $\left(2x^2 - \frac{1}{x^2}\right)^{12}$
9. Expand $(1+2x)^{-2}$ to three terms.
10. Which will be the middle term/terms in the expansion of $(x + \frac{3}{x})^{15}$
11. Convert $42^{\circ}\ 36'\ 12''$ into radians measure.
12. Find x, if $\tan^2 45^\circ - \cos^2 60^\circ = x \sin 45^\circ \cos 45^\circ . \tan 60^\circ$.
13. Prove that $\tan^2 30^\circ + \tan^2 45^\circ + \tan^2 60^\circ = \frac{13}{3}$
14. Show that $\cot^4\theta + \cot^2\theta = \operatorname{cosec}^4\theta - \operatorname{cosec}^2\theta$
15. Prove that $\cos(-\beta) = \cos\beta$
16. Show that $\sin(\alpha+\beta) + \sin(\alpha-\beta) = 2\sin\alpha\cos\beta$
17. If $\sin\theta = \frac{4}{5}$ and the terminal side of θ lies in 1st quadrant, find $\cos\frac{\theta}{2}$
18. Express $\cos\theta - \cos 4\theta$ as product.
19. In right triangle ABC, $\gamma = 90^\circ$, $a = 5$, $c = 13$ then find the value of angle α.
20. The sides of a triangle are 16, 20 and 33 meters respectively. Find its greatest angle.
21. A minaret stands on the horizontal ground. A man on the ground, 100 m from the minaret, the angle of elevation of the top of the minaret to be 60°. Find its height.
22. In any triangle ABC if $a = 16$, $b = 17$, $\gamma = 25^\circ$, Find c.
23. What are parallel vectors?
24. Given the vectors, $\bar{a} = 3i - 2j + k$, $\bar{b} = 2i - 4j - 3k$, $\bar{c} = -i + 2j + 2$,

    Find $\bar{a} + \bar{b} + \bar{c}$.
25. Find the area of parallelogram with adjacent sides, $\bar{a} = 7i - j + k$ and $\bar{b} = 2j - 3k$
26. Write the phasor (vector) Z=a + jb in Trigonometric and Exponential form.
27. Given that $Z_1 = 4\angle 60^0$ and $Z_2 = 2\angle 30^0$ find $\frac{Z_1}{Z_2}$

Contd..... P/2

SECTION-II

Note: Attempt any three (03) questions. **3x8=24**

Q.2 **(a)** Solve the equation $x^2 - 3\left(x + \frac{25}{4}\right) = 9x - \frac{25}{2}$ by using quadratic formula.

(b) Show that the roots of the equation $x^2 - 2\left(m + \frac{1}{m}\right)x + 3 = 0$ are real

Q.3 **(a)** Find the 5^{th} term in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{10}$

(b) Expand $(4 + x)^{1/2}$ upto four terms.

Q.4 **(a)** Prove that $\sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}} = \sec\theta - \tan\theta$

(b) Prove that $\frac{\tan\theta}{1 - \cot\theta} + \frac{\cot\theta}{1 - \tan\theta} = \sec\theta \operatorname{cosec}\theta + 1$

Q.5 **(a)** Prove that: $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$

(b) In any triangle ABC if $a = 211.3$, $\beta = 48^\circ 16'$, $\gamma = 71^\circ 38'$ Find b

Q.6 **(a)** If $\vec{a} = 3i - j - 4k$, $\vec{b} = -2i + 4j - 3k$ and $\vec{c} = i + 2j - k$.

Find unit vector parallel to $3\vec{a} - 2\vec{b} + 4\vec{c}$.

(b) Find the cosine of the angle between the vectors:

$\vec{a} = 2i - 8j + 3k$, $\vec{b} = 4j + 3k$

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