Roll No._____

DAE/IA-2018/09
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. $18\times2=36$

1. Solve the quadratic equation $6x^2 - 5x = 4$ by factorization.

2. Solve the equation $2x^2 + 12x - 110 = 0$ by completing the square.

3. Discuss the nature of the roots of the equation $x^2 - 2\sqrt{2}\,x + 2 = 0$.

4. If the sum of the roots of $4x^2 + k\,x - 7 = 0$ is 3, find the value of k.

5. Form the quadratic equation whose roots are $i\sqrt{3}$, $-i\sqrt{3}$

6. Expand $(x + y)^4$ by binomial theorem

7. Calculate $(0.98)^6$ by Binomial Theorem up to two decimal places.

8. Find the 7th term in the expansion of $\left(x - \dfrac{1}{x}\right)^9$

9. Expand $(4 - 3x)^{1/2}$ to three terms.

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

    (i) When "n" is even   (ii) When "n" is odd

11. Convert $120°$ into radians measure.

12. If a minute hand of a clock is 10 cm long, how far does the tip of the hand move in 30 minutes?

13. Prove that $\dfrac{2\tan\frac{\pi}{6}}{1 - \tan^2\frac{\pi}{6}} = \sqrt{3}$

14. Prove that $1 - 2\sin^2\theta = 2\cos^2\theta - 1$

15. Prove that $\sin(-\theta) = -\sin\theta$

16. Express $\sin x \cos 2x - \sin 2x \cos x$ as single term.

17. Prove that $\cos^2\alpha = \dfrac{1 + \cos 2\alpha}{2}$

18. Express $\sin(x + 30°) + \sin(x - 30°)$ as product.

19. Given that $\gamma = 90°$, $\alpha = 35°$ $a = 5$, find angle β

20. A string of a flying kite is 200 meters long, and its angle of elevation is $60°$. Find the height of the kite above the ground taking the string to be fully stretched.

21. In any triangle ABC in which $b = 45$, $c = 34$, $\alpha = 52°$, Find a

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

23. If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are direction cosines of a vector $\vec{r} = xi + yj + zk$, then show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$

24. Find a vector whose magnitude is 2 and is parallel to $5i + 3j + 2k$.

25. Prove that $\bar{a}$ and $\bar{b}$ are perpendicular to each other if $\bar{a} = i + 3j - 2k$ and $\bar{b} = i - j - k$

26. Express $\sqrt{3} + j$ in Polar form.

27. Simplify the Phasor (vector) $\dfrac{1}{4 - j5} - \dfrac{1}{5 - j4}$ and write the result in Rectangular form.

SECTION-II

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

Q.2 (a) Solve the equation $\dfrac{1}{x+1} + \dfrac{1}{x+2} + \dfrac{1}{x+3} = \dfrac{3}{x}$ by using quadratic formula.

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

Q.3 (a) Find the constant term in the expansion of $\left(x^2 - \dfrac{1}{x}\right)^9$

(b) If x is nearly equal to unity, prove that $\dfrac{mx^n - nx^m}{x^n - x^m} = \dfrac{1}{1-x}$

Q.4 (a) A flywheel rotates at 300 rev/min. If the radius is 6 cm. through what total distance does a point on the rim travel in 30 seconds ?

(b) If $\cot \theta = \dfrac{2}{3}$, and the terminal side of the angle does not lie in the first quadrant, find the remaining trigonometric ratios of θ.

Q.5 (a) Prove that $\cos 20° \cos 40° \cos 60° \cos 80° = \dfrac{1}{16}$

(b) A town B is 15 km due North of a town A. The road from A to B runs North 27°, East to G, then North 34°, West to B. Find the distance by road from town A to B.

Q.6 (a) Show that the vectors $4i - 6j + 9k$ and $-6i + 9j - \dfrac{27}{2}k$ are parallel.

(b) Find $\left|(\vec{a} \times \vec{b}) \times \vec{c}\right|$ if $\vec{a} = i - 2j - 3k, \ \vec{b} = 2i + j - k, \ \vec{c} = i + 3j - 2k$.

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