DAE/IIA-2020/SPECIAL (Covid-19) Exam:2020/09

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 the quadratic equation: $x^2 - 3x - 18 = 0$
3. For what value of 'k' the roots of the equation $kx^2 + 4x + 3 = 0$ are equal.
4. If the sum of the roots of $4x^2 + kx - 7 = 0$ is 3. Find the value of $'k'$.
5. Form the quadratic equation whose roots are $-2+\sqrt{3}, -2-\sqrt{3}$
6. Expand by Binomial theorem $\left(x + \frac{1}{x}\right)^4$.
7. State Binomial Theorem for positive integer n.
8. Find the 5th term in the expansion of $\left(2x - \frac{x^2}{4}\right)^7$
9. Expand to three terms $\frac{1}{(1+x)^2}$.
10. Which term is the middle term in $(a+b)^n$ when n is odd.
11. Convert into degree measure: 0.726 radian.
12. Find 'r' when ℓ = 33 cm and θ = 6 radian.
13. Prove that: $\cos 30° \cos 60° - \sin 30° \sin 60° = 0$
14. Prove that: $\cos^4\theta - \sin^4\theta = 1 - 2\sin^2\theta$
15. Prove that: $\tan(45° + \theta)\tan(45° - \theta) = 1$
16. Show that: $\sin(\alpha+\beta) + \sin(\alpha-\beta) = 2\sin\alpha\cos\beta$
17. Express as product: $\cos 12\theta + \cos 4\theta$
18. Find $\cos\theta$ if $\sin\theta = \frac{7}{25}$ and angle θ is an acute angle.
19. In right triangle ABC, b = 6, α = 35º, γ = 90º, Find side 'a'.
20. In any triangle ABC, if a = 20, c = 32 and γ = 70º find angle $\propto$.
21. In any triangle ABC if A = 16, b = 17, γ = 25º, Find c.
22. Define the laws of cosines.
23. Find the magnitude of vector $-2i - 4j + 3k$
24. Given the vectors: $\vec{a} = 3i - 2j + k$, $\vec{b} = 2i - 4j - 3k$, $\vec{c} = -i + 2j + 2k$. Find $\vec{a} + \vec{b} + \vec{c}$
25. Find $(\vec{a} + \vec{b}).(\vec{a} - \vec{b})$ if $\vec{a} = 2i + 2j + 3k$ & $\vec{b} = 2i - j + k$
26. Find the area of parallelogram with adjacent sides, $\vec{a} = 7i - j + k$ & $\vec{b} = 2j - 3k$
27. Find scalar x and y such that $x(i + 2j) + y(3i + 4j) = 7i + 9j$

SECTION – II

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

Q.2: **(a)** Solve by factorization: $abx^2 + \left(b^2 - ac\right)x - bc = 0$

(b) Find the value of 'k' if the product of the roots of $(k+1)x^2 + (4k+3)x + (k-1) = 0$ is $\frac{7}{2}$.

Q.3: If 'x' is nearly equal to unity, prove that: $\frac{mx^n - nx^m}{x^n - x^m} = \frac{1}{1-x}$

Q.4: **(a)** A circular wire of radius 6cm is cut straightened and then bend so as to lie along the circumference of a hoop of radius 24cm. Find the measure of the angle which it subtends at the center of the hoop.

(b) Prove that : $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$

Q.5: **(a)** Prove that : $\tan(45° + \theta) = \frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$

(b) In ΔABC if $\alpha = 60°, \beta = 45°$. Find ratio of b to c.

Q.6: **(a)** If vectors $3i + j - k$ and $\lambda i - 4j + 4k$ are parallel, find the value of λ.

(b) Prove that for vectors $\vec{a}$ and $\vec{b}$: $\left|\vec{a} \times \vec{b}\right|^2 + \left|\vec{a} \cdot \vec{b}\right|^2 = \left|\vec{a}\right|^2 \left|\vec{b}\right|^2$.

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