C. ABDUL HAKEEM COLLEGE (AUTONOMOUS),
MELVISHARAM - 632 509.
SEMESTER EXAMINATIONS, NOVEMBER - 2018

B.Sc., PHYSICS & CHEMISTRY **SEMESTER I/ III**

U15AMA101 / U15AMA301 / U14AMA301 – MATHEMATICS - I (ALLIED)

Time: Three Hours Maximum: 75 Marks

SECTION - A (10 X 2 = 20 Marks)

Answer **ALL** Questions.

1. Prove that $\frac{e-1}{e+1} = \frac{\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\cdots\infty}{\frac{1}{1!}+\frac{1}{3!}+\frac{1}{5!}+\cdots\infty}$.
2. Write expansion of $\log(1+x)$.
3. One of the roots of the equation $3x^5 - 4x^4 - 42x^3 + 56x^2 + 27x - 36 = 0$ is $\sqrt{2}+\sqrt{5}$. Find the other roots.
4. Diminish by 2 the roots of the equation $x^4 + x^3 - 3x^2 + 2x - 4 = 0$.
5. Define Hermition Matrix.
6. Prove that the matrix $\begin{pmatrix} Cos\theta & -Sin\theta \\ Sin\theta & Cos\theta \end{pmatrix}$ is orthogonal.
7. Write expansion for $\tan n\theta$..
8. Write relations between circular and hyperbolic functions.
9. Find n-th derivative of $\sin(ax+b)$.
10. If $x = u(1+v)$; $y = v(1+u)$, then find $\frac{\partial(x,y)}{\partial(u,v)}$.

SECTION - B (5 X 5 = 25 Marks)

Answer **ALL** Questions.

11. a) Resolve into partial fractions $\frac{2x+3}{(x^2+1)(x+4)}$.

(Or)

b) Prove that $\log(\frac{n+1}{n-1}) = \frac{2n}{n^2+1} + \frac{1}{3}(\frac{2n}{n^2+1})^3 + \frac{1}{5}(\frac{2n}{n^2+1})^5 + \cdots\infty$.

12. a) Solve the equation $2x^3 - x^2 - 22x - 24 = 0$ given that two of its roots are in the ratio 3 : 4.

(Or)

b) Solve the equation $4x^4 - 20x^3 + 33x^2 - 20x + 4 = 0$.

13. a) Express $\begin{pmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{pmatrix}$ as sum of a symmetric and Skew-Symmetric matrix.

(Or)

b) Show that $\begin{pmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{pmatrix}$ is unitary.

14. a) If $\frac{\tan\theta}{\theta} = \frac{2524}{2523}$, then find θ approximately.

(Or)

b) Find the value of $Log(4+3i)$.

15. a) If $y = (x + \sqrt{1+x^2})^m$ prove that $(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + (n^2 - m^2)y_n = 0$.

(Or)

b) Find the angle between the radius vector and the tangent at any point for the curve $r = a(1 + \cos\theta)$.

SECTION - C (3 X10 = 30 Marks)

Answer **ANY THREE** Questions.

16. Sum to infinity the series $\frac{11.14}{10.15.20} + \frac{11.14.17}{10.15.20.25} + \cdots \infty$.
17. Find by Newton's method an approximate value of the positive root of the equation $x^3 - 2x - 5 = 0$.
18. Verify Cayley – Hamilton Theorem of the matrix A = $\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$.

    Also find A^{-1}.
19. Prove that $64(\cos^8\theta + sin^8\theta) = cos8\theta + 24cos4\theta + 35$.
20. Find the radius of curvature of the curve $a^3 - x^3 = xy^2$ at the point $(a, 0)$.

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