SUBJECT CODE : 15MT/AC/MC15

B. Sc. DEGREE EXAMINATION, NOVEMBER 2017
BRANCH IV - CHEMISTRY
FIRST SEMESTER

COURSE   : ALLIED – CORE
PAPER   : MATHEMATICS FOR CHEMISTRY – I
TIME   : 3 HOURS   MAX. MARKS :   100

SECTION – A   **(10 X 2 = 20)**
ANSWER ALL THE QUESTIONS

1. Find the characteristic equation of $A = \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$.
2. State the Cayley Hamilton Theorem.
3. Find the value of $\alpha^2 + \beta^2 + \Upsilon^2$, where α, β, Υ are the roots of $x^3 + px^2 + qx + r = 0$.
4. If α, β, Υ are the roots of $x^3 - 4x^2 - x + 2 = 0$, find the value of (a) $\Sigma\alpha$. (b) $\Sigma\alpha\beta$.
5. Evaluate : $\frac{d}{dx}\left[sinh^{-1}\left(\frac{3x}{4}\right)\right]$.
6. Find y_n where $y = e^{2x}$.
7. Form the partial differential equation by eliminating a, b from $z = ax + by + a$.
8. Find the complete integral for the partial differential equation $pq = 1$ where p, q denote $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$ respectively.
9. State Newtons Backward Interpolation formula.
10. Form the table of backward differences for the following data:
    x :   3   4   5   6
    y :   6   24   60   120

SECTION – B   **(5 X 8 = 40)**
ANSWER ANY FIVE QUESTIONS

11. Using the Cayley Hamilton Theorem find A^{-1}, given $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$.
12. Solve the equation $x^3 - 12x^2 + 39x - 28 = 0$, given that the roots are in arithmetical progression.
13. Diminish the roots of $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$, by one and hence solve the equation.
14. Evaluate $\int \frac{dx}{(x+1)\sqrt{x^2 + x + 1}}$.
15. If $y = (sin^{-1}x)^2$, show that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 2 = 0$.
16. Solve : $pq = xy$ where p, q denote $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$ respectively.
17. From the following table, find the missing value, using the Binomial method :
    x :   2   3   4   5   6
    f(x) :   45.0   49.2   54.1   --   67.4

..2

SECTION – C   **(2 X 20 = 40)**
ANSWER ANY TWO QUESTIONS

18. (a) Find the characteristic roots and characteristic vectors of $A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{pmatrix}$.

    (b) Solve the equation : $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$.

                                                                      $(10 + 10)$

19. (a) Find y_n, where $y = \dfrac{3}{(x+1)(2x-1)}$.

    (b) Solve :$(y^2 + z^2)p - xyq = -xz$ where p , q denote $\dfrac{\partial z}{\partial x}$, $\dfrac{\partial z}{\partial y}$ respectively. $(10 + 10)$

20. (a) Using Newtons Forward difference formula, find $y(79)$, given

         $y(75) = 246$, $y(80) = 202$, $y(85) = 118$, $y(90) = 40$.

    (b) The values of x and f(x) are given below:

         x :   5   6   9   11

         f(x) :   12   13   14   16

    Using Lagranges Interpolation formula, find f (10). $(10 + 10)$

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