B.Sc. CHEMISTRY
First Semester
CLASSICAL ALGEBRA
(BSC – 103 A)

Duration: 3Hrs. **Full Marks: 70**

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins. **Marks: 50**

Answer any *four* from *Question no.* 2 to 8
***Question no.* 1 is compulsory.**

1. Derive the complete solution of a cubic equation using Cardon's method.

   Solve the equation $x^3 - 3x - 1 = 0$ using Cardon's method. (6+4=10)

2. If a,b be positive real nos and $a > b$ and n be a positive integer, then prove that $a^n > b^n$. Also if a,b,c be all positive real nos, prove that

   $\frac{(a^2+b^2)}{a+b} + \frac{(b^2+c^2)}{b+c} + \frac{(c^2+a^2)}{c+a} \geq a + b + c$ (5+5=10)

3. Define Arithmetic mean, Geometric Mean and Harmonic Mean. State and prove Cauchy Schwarz's inequality. (5+5=10)

4. What is transpose of a matrix? If A is a square matrix of order n, then A(AdjA)= $|A|I_n = (AdjA)A$, where I_n is the unit matrix of order n. (2+8=10)

5. Suppose A is defined by $A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$ and let $f(x) = 2x^2 - 3x + 5$ and g(x)= $x^2 + 3x - 10$. What is f(A) and g(A)?

   And

   Solve the following system of equation with the help of matrices

   $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$ (10)

6. If a,b,c are respectively the sum of p,q,r terms of an A.P , prove that

$$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0 \text{ and}$$

How many terms of the series 27+24+21+18+………… will add upto 126.

(5+5=10)

7. Write about limit inferior and limit superior. Test for convergence of the series

$1+\frac{1}{2}.\frac{x^2}{4}+\frac{1.3.5}{2.4.6}\frac{x^4}{8}+\frac{1.3.5.7.9}{2.4.6.8.10}\frac{x^6}{12}\ldots\ldots$ (5+5=10)

8. State Cauchy's Root test. Prove that a convergent sequence of real numbers is a Cauchy sequence. (2+8=10)

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REV-00
BSC/07/12 2016/12

B.Sc. CHEMISTRY
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Duration: 20 minutes **Marks – 20**

(PART A - Objective Type)

I. Choose the correct answer: **1×20=20**

1. If $a > b > 0$ and n be a negative term then
   (i) $a^n > b^n$ (ii) $a^n = b^n$ (iii) $a^n < b^n$ (iv) a>b

2. If n be a positive integer greater than 1, then
   (i) $n(n+1)^2 > 4n$ (ii) $n(n+1)^2 > 4(n!)^{3/n}$
   (iii) n=0 (iv) None of these

3. The inverse of a matrix A is given by
   (i) $Adj\,A = A^{-1}$ (ii) $\frac{AdjA}{|A|} = A^{-1}$
   (iii) $\frac{|A|}{AdjA} = A^{-1}$ (iv) $Adj\,A = \frac{1}{A^{-1}}$

4. If a matrix has a nonzero minor of order r, its rank is
   (i) greater than and equal to r (ii) less than and equal to r
   (iii) equal to r (iv) None of these

5. When rows and columns of a matrix are interchanged , then it is known as……. of a matrix.
   (i) inverse (ii) transpose
   (iii) adjoint (iv) None of these

6. If $a_1, a_2, \dots \dots, a_n$ be n positive real nos, then
   (i) A.M<G.M (ii) A.M≥ G.M
   (iii) A.M≤G.M (iv) None of these

7. If $a_1, a_2, a_3, \dots \dots \dots a_n$ be n positive real numbers, then $(a_1^2 + a_2^2 + \cdots \dots + a_n^2)(b_1^2 + b_2^2 + \cdots \dots + b_n^2) \geq (a_1b_1 + \cdots \dots \dots + a_nb_n)^2$ .This is the statement of
   (i) Minkowski's inequality (ii) Cauchy Schwarz inequality
   (iii) Holders inequality (iv) None of these

8. If $A = \begin{bmatrix} 1_- & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 0 & -2 \end{bmatrix}$ .Is
   (i) AB=BA (ii)AB$\neq BA$ (iii) AB=0 (iv) None of these

9. If α, β, γ be the roots of cubic equation $x^3 + px^2 + qx + r = 0$, then $\sum \alpha^2$ is
(i) $p^2 + 2q = 0$ (ii) $p^2 - 2q = 0$
(iii) $p^2 - q = 0$ (iv) 0

10. If a function remains unaltered by an interchange of any two of its variables then it is
(i) Singular function (ii) Asymmetric function
(iii) Symmetric function (iv) Cannot be defined

11.If two roots of the equation $2x^3 - x^2 - 18x + 9 = 0$ are equal in magnitude but opposite in sign, then the roots are
(i) 2,1,1 (ii) 3,- 3, $\frac{1}{2}$ (iii) 2,1,1 (iv) 1,0,0

12.If α be a root of order 3 of the equation $x^4 + bx^2 + cx + d = 0$, then α is
(i) $\frac{-8d}{3c}$ (ii) $\frac{8d}{3c}$ (iii) 1 (iv) 0

13.If $G^2 + 4H^3 > 0$ of the cubic equation $a_0x^3 + 3a_1x^2 + 3a_2x + a_3 = 0$ then the cubic has ________ imaginary roots.
(i) three (ii) four (iii) one (iv) two

14. Every convergent sequence of real numbers is
(i) Cauchy sequence (ii) Divergent sequence
(iii) Monotone sequence (iv) None of these

15.A sequence S_n is said to be bounded iff their exist a real number $k > 0$ *such that*
(i) $|S_n| \leq k$ (ii) $|S_n| \geq k$ (iii) $|S_n| = k$ (iv) $|S_n| = 0$

16. If $S_1 \leq S_2 \leq S_3 \ldots\ldots\ldots\ldots \leq S_n \leq \cdots \ldots\ldots$ in a sequence $\{S_n\}$, then it is a.......... sequence.
(i) nonincreasing (ii) nondecreasing
(iii)null (iv) None of these

17.If a sequence $\{S_n\}$ converges to l, then $\{S_n\}$ has a limit
(i) l^2 (ii)l^3 (iii) l (iv) 1

18.In D' Alembert's Ratio Test the series $\sum u_n$ of positive terms is divergent if
(i) Greater than 1 (ii) less than 1
(iii) Equal to 1 (iv) None of these

19.If α, β, γ be the roots of the cubic equation $a_0x^3 + a_1x^2 + a_2x + a_3 = 0$, then
(i) $\sum \alpha = -\frac{a_1}{a_0}$ (ii) $\sum \alpha = \frac{a_1}{a_0}$ (iii) $\sum \alpha = 0$ (iv) $\sum \alpha = 1$

20.The standard form of a cubic equation $a_0x^3 + a_1x^2 + a_2x + a_3 = 0$ with binomial coefficient is
(i) $z^3 + 3H^2z + 3H + G = 0$ (ii) $z^3 + 3Hz + G = 0$
(iii) $z = 0$ (iv) $z = 1$

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