REV-01
BSC/16/08/12

2022/12

SET A

B.Sc. CHEMISTRY
THIRD SEMESTER
CLASSICAL ALGEBRA & TRIGONOMETRY
BSM – 731

[USE OMR SHEET FOR OBJECTIVE PART]

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

(PART-A: Objective)

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. If the sides of an inequality be multiplied by the same negative quantity the sign of inequality is
   a. constant
   b. Reversed
   c. increased
   d. Decreased

2. The AM and GM of two positive numbers are 12 and 6. The HM between two numbers is
   a. 2
   b. -3
   c. 3
   d. None

3. The condition for equality of AM and GM of two positive numbers a and b is
   a. a=b
   b. $a > b$
   c. $a < b$
   d. $a \neq b$

4. If $a < b$ then which of the following is correct
   a. $a > b$
   b. $-a > -b$
   c. $-a < -b$
   d. None

5. If a and b be two numbers which of the following is GM
   a. $a+b$
   b. $\frac{a+b}{2}$
   c. $\sqrt{ab}$
   d. All of the above

6. The polar form of $-1-i$ is
   a. $\sqrt{2}\left(\cos\frac{5\pi}{4}+i\sin\frac{5\pi}{4}\right)$
   b. $\sqrt{2}\left(\cos\frac{3\pi}{4}+i\sin\frac{3\pi}{4}\right)$
   c. $\sqrt{2}\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$
   d. None of these

7. For $z = 1+2i$, $Arg(z) + Arg(\bar{z})$ is
   a. 0
   b. $-\pi$
   c. $\frac{\pi}{2}$
   d. None of these

8. The value of $f(z) = 6\bar{z} + 2iz$ at $z = \frac{1}{2} + 4i$ is
   a. $5+23i$
   b. $5-23i$
   c. $-5-23i$
   d. None of these

9. If $\frac{4+3i}{3-4i} = x + iy$, then $\frac{x}{y}$ is

a. 0
b. 1
c. $\frac{4}{3}$
d. $\frac{4}{5}$

10. The value of $(\sin\theta + i\cos\theta)^6$ is

a. $\sin 6\theta + i\cos 6\theta$
b. $\sin 6\theta - i\cos 6\theta$
c. $\cos 6\theta + i\sin 6\theta$
d. $\cos 6\theta - i\sin 6\theta$

11. $A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ is a

a. Scalar matrix
b. Unit matrix
c. Diagonal matrix
d. None of these

12. $(AB)' =$

a. $A'B'$
b. $B'A'$
c. Both a. and b.
d. None of these

13. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ then $AB =$

a. $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$
b. $\begin{pmatrix} 2 & 4 \\ 6 & 8 \end{pmatrix}$
c. $\begin{pmatrix} 6 & 20 \\ 15 & 10 \end{pmatrix}$
d. None of these

14. $(A + B)' =$

a. $A' + B'$
b. $B' + A'$
c. Both a. and b.
d. None of these

15. $A.Adj(A) = Adj(A).A =$

a. $B'A'$
b. I
c. A
d. 0

16. If p, q, r be the roots of the equation $ax^3 + bx^2 + cx + d = 0$ then, $p + q + r =$

a. $-\frac{b}{c}$
b. $\frac{b}{c}$
c. $\frac{b}{c}$
d. None

17. If p, q ,r be the roots of the equation $ax^3 + bx^2 + cx + d = 0$ then, $pq + qr + pr =$

a. $\frac{c}{a}$
b. $-\frac{c}{a}$
c. $\frac{c}{b}$
d. All of these

18. If p, q ,r be the roots of the equation $ax^3 + bx^2 + cx + d = 0$ then, $pqr =$

a. $\frac{d}{a}$ b. $\frac{c}{a}$

c. $-\frac{c}{a}$ d. None

19. If $a + ib$ be a root of an equation then other root may be

a. a b. ib

c. $a - ib$ d. $ib - a$

20. A be a matrix and if $A' = A$ then A is known as

a. Symmetric matrix b. Skew-Symmetric matrix

c. Both a. and b d. None of these

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PART-B : Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. Solve by Cardon's method **10**

$x^3 - 21x - 344 = 0$

2. **a.** Find the polar representation of $\left(\frac{6+8i}{4-3i}\right)^2$. **4+3+3 =10**

b. Find the roots of the following equations:

(i) $z^2 = 3 + 4i$

(ii) $z^5 = i$

3. **a.** Prove that $(1+i)^n + (1-i)^n = 2^{n/2+1}\cos\left(\frac{n\pi}{2}\right)$. **5+5=10**

b. Express $\cos n\theta$ in terms of $\cos\theta$.

4. Prove that **5+5=10**

a. $AH = G^2$

b. $AM \geq GM \geq HM$,where $AM = A, GM = G, HM = H$ are respectively Arithmeticmean, Geometric mean and Harmonic mean.

5. Find the rank of the following matrix reducing it to either normal form **10**

$$A = \begin{pmatrix} 4 & -1 & 2 & 5 \\ 1 & 6 & 2 & 4 \\ 3 & 1 & -2 & 3 \\ 2 & 3 & 5 & 4 \end{pmatrix}$$

6. **a.** Find the sum of the cubes of the roots of the equation **5+5=10**

$x^3 - px^2 + qx - r = 0$

b. If α, β, γ be the roots of the equation $x^3 + qx + r = 0$ the find the value of $(\beta+\gamma)^{-1} + (\gamma+\alpha)^{-1} + (\alpha+\beta)^{-1}$

7. **a.** Solve the equation $x^4 + x^3 - 16x^2 - 4x + 48 = 0$ given that the product of the two roots is 6 **5+5=10**

b. Solve the equation $x^3 - px^2 + qx - r = 0$ should have its roots are in G.P

8. **a.** The sum of the roots of the equation $x^3 + a_1x^2 + a_2x + a_3 = 0$ is zero then show that $a_1a_2 - a_3 = 0$ **5+5=10**

b. Solve $x^4 - 2x^3 + 6x^2 + 22x + 13 = 0$ having a root 2+3i

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