PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2019
(First Semester)

Branch – CHEMISTRY

MATHEMATICS – I

Time: Three Hours
Maximum: 75 Marks

SECTION-A (10 Marks)
Answer ALL questions
ALL questions carry EQUAL marks
(10 x 1 = 10)

1 If the roots are $1+\sqrt{2}$, 3, then the equation with rational coefficient is _____ .
(i) $x^3 - 5x^2 + 5x + 3 = 0$ (ii) $x^2 + 5x + 3 = 0$
(iii) $5x^2 - 5x - 3 = 0$ (iv) $x^3 - x^2 - x - 3 = 0$

2 Sum of the roots of $x^3 - 7x + 6 = 0$ is
(i) 0 (ii) -7 (iii) 6 (iv) 7

3 The locus of center of curvature is called as _____ .
(i) Involute (ii) evolute (iii) envelope (iv) circle of curvature

4 The curvature of a straight line is _____ .
(i) 3 (ii) 2 (iii) 1 (iv) 0

5 If $f(x)$ is an odd function of x, then $\int_{-a}^{a} f(x)dx$ is _____ .

(i) 0 (ii) a (iii) -a (iv) 2a

6 $\int xe^x dx$ is _____ .

(i) e^x (ii) $x - 1$ (iii) $e^x(x - 1)$ (iv) $\dfrac{e^x}{x-1}$

7 $\int_{0}^{\frac{\pi}{2}} \int_{0}^{\cos\vartheta} dr\ d\theta$ is _____ .

(i) 1 (ii) -1 (iii) $\dfrac{\pi}{2}$ (iv) $\dfrac{-\pi}{2}$

8 $\int_{0}^{1} \int_{0}^{1} \int_{0}^{1} dx\ dy\ dz =$ _____ .

(i) 1 (ii) 0 (iii) -1 (iv) 2

9 $\theta + \dfrac{\theta^3}{3} + \dfrac{2\theta^5}{15} + \ldots\ldots$ is _____ .

(i) $\sin\theta$ (ii) $\cos\theta$ (iii) $\tan\theta$ (iv) $\sec\theta$

10 $\cosh^2 x - \sinh^2 x =$ _____ .
(i) $\cosh 2x$ (ii) $\sinh 2x$ (iii) 1 (iv) -1

SECTION - B (25 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks
(5 x 5 = 25)

11 a Solve the equation $2x^3 - 11x^2 + 10x + 8 = 0$ given that one of the root is double to another of its roots.

OR

b Transform the equation $x^4 - 8x^3 - x^2 + 68x + 60 = 0$ into one which does not

12 a Show that the radius of curvature at any point of the curve $y = c \cosh \dfrac{x}{e}$ is $\dfrac{y^2}{<}$.

OR

  b Find the curvature of the curve $xy = c^2 \, t \, (c,c)$.

13 a Prove that $\displaystyle\int_{0}^{\frac{\pi}{4}} \log(1 + \tan\theta)\,d\theta = \dfrac{\pi}{8}\log 2$.

OR

  b Obtain the reduction formula for $\displaystyle\int \tan^n x\,dx$.

14 a Evaluate $\displaystyle\int_{1}^{2}\int_{1}^{x} xy^2\,dy\,dx$.

OR

  b $\displaystyle\int_{0}^{1}\int_{y^2}^{1}\int_{0}^{1-x} x \, dx\, dy\, dz$.

15 a Express $\cos 8\theta$ in terms of $\cos\theta$.

OR

  b If $\sin(A+iB)=x+iy$, then prove that

  (i) $\dfrac{x^2}{\sin^2 A} - \dfrac{y^2}{\cos^2 A} = 1$ (ii) $\dfrac{x^2}{\cosh^2 B} - \dfrac{y^2}{\sinh^2 B} = 1$

SECTION -C (40 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks   (5 x 8 = 40)

16 a If α,β,γ are the roots of $x^3+px^2+qx+r=0$, then form the equation whose roots are

  (i) $\alpha+\beta, \ \beta+\gamma, \ \gamma+\alpha$ (ii) $\dfrac{1}{\alpha^2}, \dfrac{1}{\beta^2}, \dfrac{1}{\gamma^2}$

OR

  b Solve the following equation $3x^6+x^5-27x^4+27x^2-x-3=0$.

17 a Find the centre of curvature of $x=a(t+\sin t)$ $y=a(1-\cos t)$.

OR

  b Show that the evolute of the curve $x=a(\cos\theta+\theta\sin\theta)$ $y=a(\sin\theta-\theta\cos\theta)$ is a circle.

18 a If $m>0$ and $n>0$, then prove that $\displaystyle\int_{0}^{1} x^m (1-x)^n \, dx = \dfrac{m!\,n!}{(m+n-1)!}$

OR

  b Evaluate $\displaystyle\int x^4 e^x \, dx$.

19 a Find the volume bounded by the cylinder $x^2+y^2=4$ the planes $y+z=4$ & $z=0$.

OR

  b Evaluate $\displaystyle\iiint xyz \, dx\, dy\, dz$ taken through the positive octant of the sphere $x^2+y^2+z^2=a^2$.

20 a If $\dfrac{\tan\theta}{\theta} = \dfrac{2524}{2523}$, show that θ is approximately equal to $1^0 58^1$.

OR

  b If $\cosh u=\sec\theta$, then show that $u=\log\tan\left(\dfrac{\pi}{-}+\dfrac{\theta}{-}\right)$.