PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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 equation $2x^3 - 3x^2 + 2x - 3 = 0$ has one root i then, its real root is _____.

(i) $\frac{2}{3}$ (ii) $-\frac{2}{3}$ (iii) $\frac{3}{2}$ (iv) 1

2 A reciprocal equation $a_0x^n + a_1x^{n-1} + \ldots\ldots a_n = 0$ is said to be of second type if _____.

(i) $a_{n-r} = a_{r-1}$ (ii) $a_{n-r} = a_{r+1}$ (iii) $a_{n-r} = a_r$ (iv) $a_{n-r} = -a_r$

3 The radius of curvature of the curve $y = x^1 + x^2 + x^3$ at the origin is _____.

(i) $-\sqrt{2}$ (ii) $\sqrt{2}$ (iii) $2\sqrt{2}$ (iv) $1/\sqrt{2}$

4 The evolute of the parabola $y^2 = 4ax$ is _____.

(i) a semicubical parabola (ii) a circle
(iii) a straight line (iv) an ellipse

5 $\int_0^{\pi/2} \sin^2 x dx =$ _____.

(i) 0 (ii) $\pi/2$ (iii) $\pi/4$ (iv) π

6 The value of $\int_0^{\pi/2} \cos^{14}\theta d\theta =$ _____.

(i) $\frac{429}{4096}$ (ii) $\frac{143}{1024}$ (iii) $\frac{143}{1024}\pi$ (iv) $\frac{429}{4096}\pi$

7 The value of integral $\int_{-1}^{2} \int_{x}^{x+2} dydx$ is _____.

(i) 2 (ii) 6 (iii) 5 (iv) 4

8 In polar transformations, if $x = r\cos\theta$, $y = r\sin\theta$, then $\frac{\partial(x,y)}{\partial(r,\theta)} =$ _____.

(i) ρ (ii) $r^2\sin\theta$ (iii) r (iv) 0

9 The expansion of $\cos^5\theta$ is _____.

(i) $\frac{1}{6}[\cos 5\theta + 5\cos\theta + 10\cos\theta]$ (ii) $\frac{1}{16}[\cos 5\theta + 5\cos\theta + 10\cos\theta]$

(iii) $\frac{1}{16}[\cos 5\theta + 5\cos 4\theta + 10\cos 3\theta + 10\cos 2\theta + 5\cos\theta]$

(iv) $\frac{1}{6}[\cos 5\theta + 5\cos 4\theta + 10\cos 3\theta + 10\cos 2\theta + 5\cos\theta]$

10 The value of $\cos h\, 2x =$ _____.

(i) $\cos h^2x + \sin h^2x$ (ii) $\cos h^2x - \sin h^2x$

SECTION - B (25 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 5 = 25)

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

OR

b Solve $x^5 + 4x^4 + x^3 + x^2 + 4x + 1 = 0$.

12 a Find the radius of curvature at any point of the catenary $y = c \cdot \cos h \frac{x}{c}$.

OR

b Show that the y – coordinate of the centre of curvature of the curve at the point (c, c) is 2c.

13 a Evaluate (i) $\int \frac{2x-1}{\sqrt{x^2+7x+3}}dx$ (ii) $\int \frac{7-3x}{\sqrt{2+3x+4x^2}}dx$.

OR

b Evaluate $\int x^3 (\log x)^2 dx$.

14 a Evaluate $\int_0^a \int_0^b \frac{xydydx}{\sqrt{1-x^2-y^2}}$ and describe the region of integrations.

OR

b Evaluate $\iiint_v dxdydz$, where v is the volume of the tetrahedron whose vertices are (0, 0, 0) (0, 1, 0) (1, 0, 0) and (0, 0, 1).

15 a Expand $\cos^5\theta \sin^7\theta$ in a series of sines of multiples of θ.

OR

b Prove that, $\cosh 5x = 16\cosh^5 x - 20\cosh^3 x + 5\cosh x$.

SECTION -C (40 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a If a, b, c are the roots of $x^3 + px^2 + qx + r = 0$, find the equation whose roots are (i) ab, bc, ca (ii) a^2, b^2, c^2 (iii) a (b+c), b(c+a), c(a+b)

OR

b Solve $2x^6 - 9x^5 + 10x^4 - 3x^3 + 10x^2 - 9x + 2 = 0$.

17 a Find ρ at any point of the cycloid $x = a(\theta + \sin\theta)$; $y = a(1 - \cos\theta)$.

OR

b Find the centre of curvature of the curve $x = a(\cos t + i \sin t)$; $y = a(\sin t - t\cos t)$ and prove that its evolute is a circle.

18 a Evaluate $\int \frac{8\cos x + \sin x + 5}{3\cos x + 2\sin x + 4}dx$.

OR

b If $f(m, n) = \int_0^{\pi/2} \cos^m x \cos nx dx$, prove that $f(m, n) = \frac{m}{m+n} f(m-1, n-1)$. Hence prove that, $f(n, n) = \frac{\pi}{2^{n+1}}$.

19 a Find the value of $\iint xydxdy$ taken over the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

OR

b Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}dxdy$ and hence evaluate $\int_0^\infty e^{-x^2}dx$.