PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2019
(First Semester)

Branch – **PHYSICS**

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 The roots of f(x)=0 may not all be _____.
(i) real (ii) closed
(iii) open (iv) none of the above

2 All reciprocal equations may be reduced to an even degree reciprocal equations with __ signs.
(i) equal (ii) unequal
(iii) like (iv) unlike

3 The curvature is reciprocal of _____.
(i) its own equation (ii) radius of curvature
(iii) centre (iv) none of the above

4 The locus of the centre of curvature for a curve is called _____.
(i) radius of curvature (ii) co-ordinates
(iii) involute (iv) evolute

5 If f(x) = - f(-x) then f(x) is said to be _____.
(i) even (ii) odd
(iii) constant (iv) none

6 $\int \frac{dx}{1+x^2} =$ _____.
(i) cot x + c (ii) $\cot^{-1} x + c$
(iii) $\tan^{-1} x + c$ (iv) tan x + c

7 $\int_a^b f(x)dx = F(b) - F(a)$ is called
(i) algebra (ii) polynomial
(iii) indefinite integral (iv) definite integral

8 Evaluate $\int_0^1\int_0^2\int_0^3 (x+y+z)dxdydz$
(i) 18 (ii) 19/2
(iii) 20 (iv) 17/2

9 $\cos h^2x - \sin h^2x =$ _____.
(i) 0 (ii) -1
(iii) 1 (iv) ∞

10 cos 2 θ = _____.
(i) 2 cos θ sin θ (ii) 2 cos θ
(iii) $1 + 2\sin^2\theta$ (iv) $1 - 2\sin^2\theta$

SECTION - B (25 Marks)

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

11 a Sole the equation $x^4 - 4x^2 + 8x + 35 = 0$, given that $2 + i\sqrt{3}$ is a root of it.

OR

b If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, form the equation whose roots are $\alpha + 1/\beta\gamma$, $\beta + 1/\gamma\alpha$, $\gamma + 1/\alpha\beta$.

12 a What is the radius of curvature of the curve $x^4 + y^4 = 2$ at the point (1, 1)?

OR

b Prove that the (P, r) equation of the cardioid $r = a(1 - \cos\theta)$ is $p^2 = r^3/2a$.

13 a Show that $\int_{-a}^{+a} f(x)dx = 2\int_{0}^{a} f(x)dx$, if f(x) is an even function of x.

OR

b Calculate $\int x^3 \cos 2x dx$.

14 a Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

OR

b Find the volume bounded by the cylinder $x^2 + y^2 = 4$, the plane $y + z = 4$ and $z = 0$.

15 a Express $\frac{\sin 6\theta}{\sin\theta}$ interms of $\cos\theta$.

OR

b Reduce $(\alpha + i\beta)^{x+iy}$ to the form A + iB.

SECTION -C (40 Marks)

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

16 a Find the condition for the roots of the equation $x^3 + px^2 + qx + r = 0$ to be in geometric progression and hence solve the equation $3x^3 - 26x^2 + 52x - 24 = 0$.

OR

b Solve the equation $2x^5 - 15x^4 + 37x^3 - 37x^2 + 15x - 2 = 0$

17 a Show that the evolute of the cycloid $x = a(\theta - \sin\theta)$; $y = a(1 - \cos\theta)$ is another cycloid.

OR

b Show that the radius of curvature of the curve $r^n = a^n \cos n\theta$ is $\frac{a^n r^{-n+1}}{n+1}$.

18 a Calculate $\int_0^{\pi} \theta \sin^3 \theta d\theta$.

OR

b If $\int_0^{\pi/2} \cos^m x \cos nx dx = f(m,n)$, 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 Change the order of integration in the integral $\int_0^a \int_{x^2/a}^{2a-x} xy \, dx \, dy$ and evaluate it.

OR

b A plane lamina of non-uniform density is in form of a quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. If the density at any point (x, y) be k, xy, where k is a constant, find the co-ordinates of the centroid of the lamina.

20 a Expand $\sin^3 \theta \cos^5 \theta$ in a series of sines of multiples of θ.

OR

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

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

Z-Z-Z END