

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 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 If α and β are the roots of $2x^2+3x+5=0$, then $\alpha+\beta$ is _____.
 (i) $\frac{5}{2}$ (ii) $-\frac{3}{2}$ (iii) $-\frac{5}{2}$ (iv) $\frac{3}{2}$
- 2 If α, β, γ are the roots of the equation $x^3-px^2+qx-r=0$, then $\sum a^2$ is _____.
 (i) p^2-2q (ii) p^3-2q^2 (iii) p^2-4q^2 (iv) $5p^2-2q$
- 3 If $y=e^x$ at the point it crosses the Y-axis, then the radius of curvature is _____.
 (i) $\sqrt{2}$ (ii) $5\sqrt{2}$ (iii) $2\sqrt{2}$ (iv) $3\sqrt{2}$
- 4 If $y^2=4ax$, then $\frac{dy}{dx}$ is _____.
 (i) $\frac{1}{t}$ (ii) $\frac{2}{t}$ (iii) $\frac{3}{t}$ (iv) $\frac{5}{t}$
- 5 The value of $\int_0^{\frac{\pi}{2}} \cos^8 x dx$ is _____.
 (i) $\frac{15\pi}{72}$ (ii) $\frac{5\pi}{8}$ (iii) $\frac{115\pi}{126}$ (iv) $\frac{105\pi}{768}$
- 6 The value of $\int x \sin x dx$ is _____.
 (i) $x^2 \cos x$ (ii) $-x \cos x + \sin x$
 (iii) $x \sin x + \cos x$ (iv) $x \cos x - \sin x$
- 7 The value of $\int_0^1 \int_1^2 (x^2 + y^2) dx dy$ is _____.
 (i) $\frac{8}{3}$ (ii) $\frac{7}{3}$ (iii) $\frac{6}{5}$ (iv) $\frac{5}{2}$
- 8 The value of $\int_0^1 \int_{x^2}^{2-x} xy dy dx$ is _____.
 (i) $\frac{8}{3}$ (ii) $\frac{7}{3}$ (iii) $\frac{3}{8}$ (iv) $\frac{5}{2}$
- 9 The value of $\operatorname{sech}^2 x + \tanh^2 x$ is _____.
 (i) 4 (ii) 0 (iii) 1 (iv) 2
- 10 The value of $\cosh^2 x - \sinh^2 x$ is _____.
 (i) 4 (ii) 0 (iii) 1 (iv) 2

SECTION - B (25 Marks)

Answer ALL questions

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

- 11 a Solve the equation $x^4+2x^3-16x^2-22x+7=0$ which has a root $2+\sqrt{3}$.

OR

12 a Calculate the radius of curvature at (x, y) for the curve $a^2y = x^3 - a^3$.

OR

b Calculate the centre of curvature of the curve $y = 3x^3 + 2x^2 - 3$ at $(0, -3)$.

13 a Evaluate $\int x^4 e^{2x} dx$.

OR

b Solve $\int_0^{\frac{\pi}{2}} \sin^7 x \cos^5 x dx$.

14 a Solve $\int_0^a \int_0^{\sqrt{ax-x^2}} x^2 dy dx$.

OR

b Calculate the area between the parabola $y = 4x - x^2$ and the line $y = x$.

15 a Express $\cos 5\theta$ in terms of $\cos \theta$.

OR

b Prove that $\cosh^{-1} x = \log[x + \sqrt{x^2 - 1}]$.

SECTION -C (40 Marks)

Answer ALL questions

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

16 a Solve the equation $6x^5 - x^4 - 43x^3 - 43x^2 + x - 6 = 0$.

OR

b Solve the equation $6x^3 - 11x^2 - 3x + 2 = 0$ given that its roots are in H.P.

17 a Find the equation of the evolute of the curve $x^{\frac{3}{2}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.

OR

b Find ρ for the curve $x^3 + y^3 = 3axy$ at $\left(\frac{3a}{2}, \frac{3a}{2}\right)$.

18 a Evaluate $\int_0^{\frac{\pi}{2}} \sin^n x dx$.

OR

b Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$.

19 a Examine $\iiint_D (x+y+z) dx dy dz$ where $D: 1 \leq x \leq 2, 2 \leq y \leq 3, 1 \leq z \leq 3$.

OR

b Examine the double integral $\int_0^1 \int_0^{x^2} (x^2 + y^2) dy dx$.

20 a Prove that $\frac{\cos 7\theta}{\cos \theta} = 64 \cos^6 \theta - 112 \cos^4 \theta + 56 \cos^2 \theta - 7$.

OR

b Separate into real and imaginary parts of $\sin(x+iy)$.