

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2017  
(First Semester)

Common to Branches - STATISTICS / PHYSICS & CHEMISTRY

**MATHEMATICS -1**

Time : Three Hours

Maximum : 75 Marks

**SECTION-A (20 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 Form the equation with rational coefficients whose roots are  $1 - \sqrt{2}$  and  $2$ .
- 2 Solve  $x^3 - 12x^2 + 39x - 28 = 0$  whose roots are in A.P.
- 3 Find the radius of curvature of  $x^4 + y^4 = 2$  at  $(1, 1)$ .
- 4 Find the coordinates of the centre of curvature of the curve  $y = x$  at  $(Vi, A)$ .
- 5 Evaluate  $\int_0^1 x \sin^2 x \, dx$ .
- 6 Evaluate  $\int_0^{\infty} x e^{-x} \, dx$ .
- 7 Evaluate  $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x + y) \, dx \, dy$ .
- 8 Evaluate  $\int_1^{2\sqrt{3}} \int_x^{x^2} y \, dy \, dx$ .
- 9 Expand  $\tan 88^\circ$  in terms of  $\tan \theta$ .
- 10 Separate into real and imaginary parts of  $\sin(x + iy)$ .

**SECTION - B (25 Marks)**

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Solve  $x^4 - 8x^3 + 14x^2 - 8x - 15 = 0$  given that the sum of two roots is equal to the sum of the other two.  
OR  
b Diminish the roots of the equation  $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$  by 1 and hence solve the equation.
- 12 a Find the radius of curvature at a point  $(a \cos^3 \theta, a \sin^3 \theta)$  on the curve  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$   
OR  
Find the radius of curvature of the catenary of uniform length  $y = a \log \sec \theta$  —

Cont...

13 a Evaluate  $\int_0^{\frac{\pi}{2}} \log \sin x \, dx$ .

OR

b Evaluate  $\int_0^{\infty} \frac{dx}{1+x^2}$ .

14 a Evaluate  $\int_0^1 \int_0^1 \int_0^1 (x^2+y^2) \, dy \, dx$ .

OR

b Evaluate  $\int_0^a \int_0^{x+y} \int_0^z e^{x+y+z} \, dz \, dy \, dx$ .

15 a If  $x + iy = \cos(A + iB)$  prove that  $(1+x)^2 + y^2 = (\cosh B + \cos A)^2$ .

OR

b If  $\cos(x + iy) = \cos \theta + i \sin \phi$  find  $\cos 2x + \cosh 2y$ .

**SECTION - C (30 Marks!**

Answer any **THREE** Questions

**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Solve :  $6x^6 - 25x^5 + 31x^4 - 31x^2 + 25x - 6 = 0$ .

17 Find the evolute of  $xy = c^2$ .

18 If  $I_n = \int_0^1 x^p (1-x^q)^n \, dx$ , where  $p, q, n$  are positive integers find  $(p+qn+1)I_n$ .  
Evaluate  $I_4$ .

19 Evaluate  $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dx \, dy \, dz}{(x+y+z+1)^3}$  taken over the volume bounded by the planes  $x=0, y=0, z=0, x+y+z=1$ .

20 Expand  $\cos^2 \theta \sin^5 \theta$  in a series of cosines of multiples of  $\theta$ .

Z-Z-Z

END