

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
BSc DEGREE EXAMINATION MAY 2017  
(Third Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

CLASSICAL ALGEBRA AND TRIGONOMETRY

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10x2 = 20)

Form a rational cubic equation which shall have for roots 1, 3 -  $\sqrt{2}$ .

State other 3 roots of the equation if one root is  $\sqrt{5} + \sqrt{2}$ .

Test the series  $\sum_{n=0}^{\infty} \frac{1}{2^n + 1}$  is convergent or divergent.

Is the series  $1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$  convergent?

Is  $\frac{n+1}{\sqrt{n+2}}$ , a monotonic increasing sequence?

- 6 State Cauchy's root test.
- 7 Expand  $\cos^n \theta$ .
- 8 Verify  $\cos^2 x + \sin^2 x = \cos 2x$ .
- 9 Find  $\log(1+i)$

10 Find the value of  $2^3 < 1 \frac{1}{5} + \frac{1}{i2} + \dots >$

SECTION - B (25 Marks)

Answer ALL Questions

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

- 11 a Solve the equation  $81x^3 - 18x^2 - 36x + 8 = 0$  whose roots are in harmonic progression. '
 

OR

 b Frame an equation with rational coefficients, one of whose roots is  $\sqrt{5} + \sqrt{2}$
- 12 a Discuss the convergence of the series  $\sum \frac{1}{n^k}$ ,
 

OR

 b Prove that if  $\{a_n\}$  converges to a and  $\{b_n\}$  to b, then  $\{a_n b_n\}$  converges to ab.
- 13 a Examine the convergence of
 
$$\frac{1^2}{2^2} + \frac{1^2 \cdot 3^2}{2^2 \cdot 4^2} + \frac{1^2 \cdot 3^2 \cdot 5^2}{2^2 \cdot 4^2 \cdot 6^2} + \dots$$

OR

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b Show that the series  $\sum_{n=1}^{\infty} \frac{1}{n(1+nx)}$  is uniformly convergent for all values of

14 a Express  $\frac{1 - i \sin 60^\circ}{1 + i \sin 60^\circ}$  in terms of  $\cos \theta$ .

OR

b Express  $\cosh 60^\circ$  in terms of hyperbolic cosines of multiples of  $0$ .

15 a Reduce  $(a + ip)^{x + iy}$  to the form  $A + iB$ .

OR

b Find the sum of series  $\cos^2 x + \cos^2 (x+y) + \cos^2 (x + 2y) \dots$  upto  $n$  terms.

**SECTION - C (30 Marks)**

Answer any THREE Questions

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

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

17 Discuss the convergence of the series.

$$\sum_{n=1}^{\infty} \frac{2^{n-1}}{(a+n)^p (b+n)^q} \quad (a, b, p, q \text{ being all positive})$$

18 Examine the convergence of the series

$$\frac{1}{1^k} + \frac{x^2}{3^k} + \frac{x^4}{5^k} + \dots + \frac{x^{2n-2}}{(2n-1)^k} + \dots$$

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

20 Sum to infinity of the series:

$$\cos a + \frac{1}{2} \cos (a + p) + \frac{1}{4} \cos (a + 2p) + \dots$$

Z-Z-Z

END