PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2018
(First Semester)

Branch – **MATHEMATICS**

CLASSICAL ALGEBRA & TRIGONOMETRY

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Find the limit of sequence defined by $a_n = \frac{(-1)^2}{2+n} + 1$; apply the definition.

2 When does a monotonic decreasing sequence tends to minus infinity?

3 State Raabe's test.

4 What is conditionally convergent series? Give an example.

5 When can an equation have atleast one positive root and atleast one negative root?

6 Transform $x^n+p_1x^{n-1}+p_2x^{n-2}+.....+p_n$ into another whose roots are same as those of the above but opposite in sign.

7 Expand $\tan 7\theta$ in terms of $\tan \theta$.

8 Write the coefficients of the terms in the expansion of $\left(x + \frac{1}{x}\right)^6$.

9 Prove $\log \frac{a+ib}{a-ib} = 2i \tan^{-1} \frac{b}{a}$.

10 Using Gregory's series evaluate $\frac{\pi}{4}$.

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Find whether the series in which $u_n = \left(n^3+1\right)^{1/3} - n$ is convergent or divergent.

OR

b Show that $\left\{\frac{n}{n+1}\right\}$ is monotonic increasing sequence.

12 a Examine the convergence of $1^2x+2^2x^2+3^2x^3+...$

OR

b Discuss the convergence of $1 + \frac{(1!)^2}{2!}x + \frac{(2!)^2}{4!}x^2 + \frac{(3!)^2}{6!}x^3 + ...$

13 a If α, β, γ are roots of the equation $x^3+ax^2+bx+c=0$, form the equation whose roots are $\alpha\beta, \beta\gamma$ and $\gamma\alpha$.

OR

b Solve $x^4-8x^3+14x^2+8x-15=0$, being given that sum of two of the roots is equal to the sum of the other two.

14 a Prove $\frac{1+\tan \lambda x}{1-\tan \lambda x} = \cos \lambda 2x + \sin \lambda 2x$

OR

b Evaluate $\lim_{x \to 0} \frac{\sin x - x \cos x}{x^3}$

Cont...

15 a If $\tan \log(x+iy)=a+ib$ where $a^2+b^2 \neq 1$ prove $\tan \log(x^2+y^2)=\frac{2s}{1-a^2-b^2}$

OR

b Find the sum of the series $\sin\alpha \sin 2\alpha + \sin 2\alpha \sin 3\alpha + \ldots + n$ terms

SECTION - C (30 Marks)

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

16 Show that the series $\sum \frac{\{(n+1)r\}}{n^{n+1}}$ is convergent if r<1 and divergent if r≥1

17 Find the limit of the sequence $\{a_n\}$ where $a_n = \left(1+\frac{1}{n}\right)^n$

18 Find the condition that the general biquadratic equation $ax^4+4bx^3+6cx^2+4dx+e=0$ may have 2 pairs of equal roots.

19 Expand cos6 θ in terms of sin θ

20 Find the general value of $(x+iy)^{\alpha+i\beta}$ and show that the sum of the moduli of the values less than unity of $(1+i)^{(1+i)}$ is $\frac{1}{\sqrt{2}} e^{3\pi/4} \cos ec\pi$

Z-Z-Z END