# Bsc. DEGREE EXAMINATION,APRIL 2020
## I Year II Semester
## Classical Algebra

**Time : 3 Hours** **Max.marks :75**

### Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Write down the expansion for $\frac{1}{e}$
2. Show that $\frac{e+1}{e-1}=\frac{\frac{1}{1!}+\frac{1}{3!}+\ldots}{\frac{1}{2!}+\frac{1}{4!}+\ldots}$
3. If $\sqrt{2}+\sqrt{5}$ is one of the roots of an equation, what are the other roots of that equation?
4. Find one root of the equation $x^3-12x^2+39x-28=0$ whose roots are in arithmetic progression.
5. Change the equation $2x^4-3x^3+3x^2-x+2=0$ into another, the coefficient of whose highest term will be unity.
6. Define a reciprocal equation.
7. Write down any two properties of an orthogonal matrix.
8. State Cayley-Hamilton theorem.
9. Find the sum of all the divisors of 360.
10. State Wilson's theorem.
11. Find one root of the equation $3x^3-26x^2+52x-24=0$ given that the roots are in geometric progression.
12. Find the characteristic equation of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 3 \end{bmatrix}$

### Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Prove that $\frac{e^2-1}{e^2+1} = \frac{\frac{1}{1!}+\frac{1}{3!}+\frac{1}{5!}+....}{1+\frac{1}{2!}+\frac{1}{4!}+.....}$
14. Form the equation of the lowest degree with rational coefficients whose roots are $1+\sqrt{2}$ and $3$
15. Increase by 7 the roots of the equation $3x^4+7x^3-15x^2+x-2=0$

16. Find the characteristic equation of the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$
17. Find the number of integers less than $n$ and prime to it when $n$=729 and 720
18. Sum the series $1 - \frac{1}{5} + \frac{1.4}{5.10} - \frac{1.4.7}{5.10.15} + \ldots$
19. Prove that the matrix $\begin{bmatrix} cos\theta & sin\theta & 0 \\ -sin\theta & cos\theta & \theta \\ \theta & \theta & 1 \end{bmatrix}$ is orthogonal.

## **Section C** $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Sum to infinity of the series $\frac{5}{1!} + \frac{7}{3!} + \frac{9}{5!} + \ldots$
21. Form the equation with rational coefficients whose roots are $4\sqrt{3}$, $5+2i$
22. Solve $6x^4 - 25x^3 + 37x^2 - 25x + 6 = 0$.
23. Diagonalize the matrix $\begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$
24. Show that the $8^{th}$ power of any number is of the form $17m$ or $17m \pm 1$.

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