MAHISHADAL RAJ COLLEGE
B.SC(H), 2ND SEMESTER EXAMINATION 2020
DEPARTMENT OF MATHEMATICS
PAPER-GE2

1. Answer the following questions:

a) If $x + 1/x = 2cos\frac{\pi}{7}$, then show that $x^7 + \frac{1}{x^7} = -2$

b) State the Descartes' rule of signs.

c) Find the rank of the matrix A= $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$

d) State Fundamental theorem of Arithmetic.

e) Find the eigen value of A= $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

2. Answer the following questions:

a) If $cos\alpha + cos\beta + cos\gamma = 0 = sin\alpha + sin\beta + sin\gamma$, then show that

$$cos^2\alpha + cos^2\beta + cos^2\gamma = sin^2\alpha + sin^2\beta + sin^2\gamma = \frac{3}{2}$$

b) Investigate, for what values of λ and μ ,the following equations

$$x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$$

have i) no solution, ii) a unique solution and iii) an infinite number of solutions.

c) State the Cayley-Hamilton theorem.

Show that the matrix A= $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ satisfies its own characteristic equation.

MAHISHADAL RAJ COLLEGE
DEPARTMENT OF MATHEMATICS
INTERNAL ASSESSMENT
B.SC(H),3rd SEM
PAPER-GE3

ANSWER ANY FIVE QUESTIONS: **2×5=10**

1.Find the value of the constant d such that the vectors (2i-j+k),(i+2j-3k) and (3i+dj+5k) are coplanar.

2.What is reciprocal system of vectors?

3.Find the unit vector, in the plane of the vectors (i+2j-k) and (i+j-2k),which is perpendicular to the vector 2i-j+k.

4.Show that the volume of the tetrahedron, the co-ordinates of whose vertices are (0,1,2),(3,0,1),(1,1,1) and (4,3,2) is 4/3 cubic units.

5.Solve: $\frac{d^2y}{dx^2}+a^4y=0$

6.Find the particular integral of the differential equation

$\frac{d^2y}{dx^2}+a^2y = secax$

7.Show that the sets of functions $\{1, x, x^2\}$ is linearly independent.

MAHISHADAL RAJ COLLEGE
DEPARTMENT OF MATHEMATICS
INTERNAL ASSESSMENT-1
B.SC(G),3rd SEM
PAPER-CORE-7(DSC-1C)

ANSWER ANY FIVE QUESTIONS: ***2×5=10***

1. Define supremum and infimum of a set of real number.
2.State Archimedean property of R.
3.State Bolzano-Weierstrass theorem for infinite point set.
4.Find the supremum and infimum of the set
{-2,3/2,-4/3,5/4,-6/5,7/6,-8/7,9/8,.....}
5.If A is a non-empty set of real numbers which is bounded below and if the set (-A) is defined by –A={-x:x∈A},show that inf A=-sup(-A)
6.Determine which of the following sets of real numbers are bounded above or bounded below:
i)s_1={all even integers starting from 2}
ii)s_2={all negative integers}
7. Define limit point and derived set.
8. State the density property of real numbers.
9. Define open set and closed set.

MAHISHADAL RAJ COLLEGE
DEPARTMENT OF MATHEMATICS
INTERNAL ASSESSMENT-1
B.SC(G),3rd SEM
PAPER-SEC-1

ANSWER ANY FIVE QUESTIONS: ***2×5=10***

1.If f(x)=$x^3 - 3x^2 + 4x - 3$,then find $f(1)$ and $f(\sqrt{2})$.

2.Find the remainder, when $(x^4 + 5x^3 + 4x^2 + 8x - 20)$ is divided by$(x - 1)$.

3.State Descart's rule of sign.

4.Find the cubic equation whose two roots are 1,2+3i.

5.Apply Descart's rule of sign to find the nature of the roots of the equation

$$x^4 + x^2 + x - 1 = 0$$

6. If 1,α,β,γ,.... Are the roots of the equation $x^n - 1 = 0$, then show that

$$(1-\alpha)(1-\beta)(1-\gamma)\ldots\ldots=n$$

7. Solve the equation $x^3 - 3x^2 + 4 = 0$, two of its roots being equal.

8. Find the condition that the cubic $x^3 - px^2 + qx - r = 0$ should have its roots in G.P.

9. Find the relation between a and b in order that $(2x^4 - 7x^3 + ax + b)$ may be exactly divisible by $(x - 3)$

MAHISHADAL RAJ COLLEGE
B.SC(G), 4TH SEMESTER EXAMINATION 2020
DEPARTMENT OF MATHEMATICS
PAPER-DSC-1D

1. **Answer the following questions:**
   a) show by an example that the set Z of all integers does not satisfies associative property.
   b) Show that the permutation $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$ is even.
   c) Define integral domain.
   d) Show that a group G is abelian , if $(ab)^2 = a^2b^2$,for a,b∈G.
   e) Define cyclic group.
2. **Answer the following questions:**
   a) Show that the set of cube roots of unity is a finite abelian group with respect to multiplication.
   b) Show that the set {1,-1,i,-i} forms a cyclic group for multiplication. Find its generator.
   c) Find the inverse of the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 4 & 2 \end{pmatrix}$.