Paper-I : BM-301 : Analysis. Assignment - I

Attempt any five questions out of eight.

Q.1 If f is a bounded function and P^* is refinement of P, then prove $U(f,P^*) \leq U(f,P)$

Q.2 Prove every bounded monotonic function is an integrable function.

Q.3 Test the convergence of integral $\int_0^1 \frac{dx}{\sqrt{1-x^3}}$

Q.4 Evaluate $\int_0^\infty \frac{\tan^{-1}ax}{x(1+x^2)}\,dx$ if $a \geq 0$

Q.5 State and prove Abel's test for convergence of series.

Q.6 State and prove Young's theorem for ~~###~~ change of order of partial derivatives.

Q.7 Find the Fourier series expansion of function f with period 2π defined as:

$$f(x) = \begin{cases} -1 & \text{for } -\pi < x < 0 \\ 1 & \text{for } 0 \leq x \leq \pi \end{cases}$$

Also deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \cdots$

Q.8 Find the Fourier series expansion of function $f(x) = x + x^2$ in $[-\pi, \pi]$

Paper-I : BM-301 : Analysis . Assignment-II

Attempt any five questions out of eight.

Q.1 Determine the image as stereographic projection of the point on sphere of radius '1' and centre (0,0,0) given by $2-3i$

Q.2 State and derive Cauchy-Riemann equations in polar form

Q.3 Determine the analytic function whose real part is $x^3-3xy^2+3x^2-3y^2+2x+1$.

Q.4 Find fixed, normal form and nature of bilinear transformation $w=\frac{z}{z-2}$

Q.5 Let A, B be subsets of a metric space (X, d). Prove that $\delta(A\cup B) \leq \delta(A)+\delta(B)+d(A, B)$

Q.6 In a metric space (X, d), prove each open sphere is an open set.

Q.7 Prove every Cauchy sequence is bounded in a metric space

Q.8 Prove that an isometry is a uniformly continuous function in a metric space.

Paper-II : BM-302 : Abstract Algebra. Assignment-I

Attempt any five questions out of eight.

Q.1 Prove that Normaliser of an element of a group is subgroup of group.

Q.2 Prove that centre of a group is normal subgroup of group.

Q.3 State and prove Sylow's first theorem on groups

Q.4 Prove every field is an integral domain

Q.5 Prove that arbitrary intersection of subrings is a subring

Q.6 If S_1 and S_2 be two ideals of a ring R then prove that $S_1 + S_2 = \langle S_1 \cup S_2 \rangle$

Q.7 Prove that the set of all units in a commutative ring with unity elements forms an abelian group with respect to multiplication in R

Q.8 Let R be an integral domain with unity. Then units of R and $R[x]$ are same.

Paper-II: Abstract Algebra : BM-302. Assignment-II

Attempt any five questions out of eight.

Q.1 Prove that intersection of any family of subspaces of a vector space V(F) is subspace of V(F)

Q.2 Prove that there exists a basis for each finitely generated vector space

Q.3 Determine whether or not the vectors (1,1,2), (1,2,5), (5,3,4) forms a basis of R^3?

Q.4 Prove that every n-dimensional vector space U(F) is isomorphic to F^n.

Q.5 Show that the linear transformation $T: R^2 \to R^3$ defined by $T(x,y) = (x+y, x-y, y)$ is a non-singular transformation.

Q.6 Prove that every inner product space is a metric space

Q.7 Let M and N be subspaces of a finite dimensional inner product space V. Then show that $(M+N)^\perp = M^\perp \cap N^\perp$

Q.8 Let S be an orthonormal set of vectors in an inner product space. Then S is linearly independent set.

Paper-III : BM-303 : Programming in C and Numerical Analysis

Assignment - I

Attempt any five questions out of eight

Q.1 Explain the following in context of C language
(i) getchar() (ii) putchar() (iii) gets() (iv) puts()

Q.2 Write a C program to display following output

```
1 2 3 4
1 2 3
1 2
1
```

Q.3 Differentiate between Static and Automatic Variables.

Q.4 What do you mean by an array? Explain how an array can be defined

Q.5 Find the root of $x^3-2x+5=0$ using Newton-Raphson Method

Q.6 Derive Sterling formula for interpolation

Q.7 Evaluate $\int_{0.2}^{1.5} e^{-x^2}dx$ using Gaussian Quadrature formula with $n=3$

Q.8 Solve the following equations by Jaccobi's Method:

$$5x+2y+z=12$$
$$x+4y+2z=15$$
$$x+2y+5z=20$$

Paper - III : BM-303 : Programming in C and Numerical Analysis

Assignment - II

Attempt any five questions out of eight.

Q.1 Solve by the Euler's modified method the following equation for $x = 0.02$ by taking $h = 0.01$ where
$$\frac{dy}{dx} = x^2 + y, \quad y = 1 \text{ when } x = 0$$

Q.2 Solve the boundary value problem for $x = 0.5$
$$\frac{d^2y}{dx^2} + y + 1 = 0, \quad y(0) = y(1) = 0$$

Q.3 Find the least square approximation of the form $y = a + bx^2$ for the data

x	0	0.1	0.2	0.3	0.4	0.5
$f(x)$	1	1.01	0.99	0.85	0.81	0.75

Q.4 Fit a straight line to the given points (x, y) by the method of least squares
$(0,3)$, $(2,1)$, $(3,-1)$, $(5,-2)$

Q.5 Use the linear congruential method to generate a sequence of random numbers $X_0 = 7$, $a = 5$, $c = 3$ and $m = 16$. Stop when repetition starts

Q.6 Generate random numbers by middle square generators starting from 4 digit number 4655. (Taking 21 generators)

Q.7 Write a short note on Monte Carlo integration